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THE SOCIAL IMPLICATIONS OF SCIENTIFIC RESEARCH*

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"Experiment is the sole source of truth. It alone can teach us anything new; it alone can give us certainty. But to observe is not enough. The scientist must set in order. Science is built up with facts as a house is with stones. But a collection of facts is no more science than a heap of stones is a house."

—H. POINCARE.

"Until man rises to the fullness of his moral height and insists upon the right to perform the full task for which his abilities equip him, we shall have an eternally imperfect state whose principles swing backward and forward between two concepts of basic authority. Another 5,000 years may see either one of two things; some improvement or utter extinction. Man cannot forever quarrel with himself and survive."

—ARTHUR C. PARKER.

WE are assembled today to honour the memory of one of Canada's noblest sons, for whom it is fitting that this lectureship should be established. Dr. Banting's life and work have had profound significance for the human race. He placed in the hands of doctors means whereby the horrors of one of nature's most feared scourges could be mitigated. Countless victims of diabetes the world over are now happily living, and an even greater multitude yet unborn may well rise to bless his name. Doctors in every land will ever revere his memory. Only one who has watched a victim of diabetes gradually fail from exhaustion and die in a state of profound stupor, often lasting for several days, can appreciate the miracle of insulin. It is with a deep sense of humility that I approach the task of addressing you, for the opportunity of participating in these exercises is indeed a high privilege.

Dr. Banting made two contributions to medicine which entitle him to distinction: first, the isolation of insulin; second, his stimulation of scientific research. The importance of the latter is not fully appreciated. Several medical discoveries of vital importance to humanity followed soon after the isolation of insulin. The impetus for many of these investigations can be traced directly to Dr. Banting's influence. The value of research, therefore, is a proper theme for consideration at this time. It was the subject closest to Dr. Banting's heart. He was one of the first to realize that it was his country's greatest need. He deplored the fact that each year large numbers of young Canadians were migrating to other countries because opportunities for special study were lacking in his homeland. The idea gripped him with patriotic fervor. The discovery of insulin seemed to him but an incident in his career. His real mission was to promote and stimulate research in the field of medicine. For him there could have been no more appropriate reward than the founding of the Banting Institute for Medical Research.

Man is one of the oldest, and yet, from a physical point of view, one of the poorest equipped animals on earth. His superior intelligence accounts for his survival because it has enabled him to ensure an adequate food supply and protection against the destructive forces in nature. Indeed, the most potent enemies of the human race have been man himself and parasitic disease.

Eolithic man, or the dawn man, appeared before the first glacial epoch upwards of 350,000 years ago. If the distance which he has travelled since be represented by six miles, the date 4241 B.C., when he made his first recorded scientific observation, would be only six inches from the end of the line. That is to say, the

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Egyptians in 4241 B.C., from long-continued observations of the movements of the heavenly bodies and from accurate records of these observations, had drawn the conclusions of a 365-day calendar year and the knowledge of the need for an occasional adjustment of one day. Accordingly, in this six-mile pathway of his existence man travelled all but six inches of his six miles before he made his first known and recorded scientific deduction. He then continued along his six-mile pathway to within two inches of the end before he seriously began to examine nature from the scientific point of view. To evaluate more definitely the development and use of the scientific method in the historical period, let us construct another line dating from this first known recorded scientific observation, the calendar year in 4241 B.C. Since then, 6,185 years have elapsed, which may be represented by a distance of, roughly, 500 feet. Along this new pathway of 500 feet he would have travelled 496 feet before he reached the point where active scientific research began. Indeed, much of it would begin less than two feet from the end, or the present day. These figures convey graphically how recent is the application of the scientific method to human needs.

From the dawn of his career down through the countless ages, man has had no adequate explanation for the vicissitudes of nature which have either favourably or unfavourably affected his destiny. The phenomena of life and death have been a mystery which have ever defied his metaphysical reasoning and speculation. Now and then through the centuries a philosopher has appeared who by experiment has attempted to illuminate the unknown. But this type of thinker has not been looked upon with favour. He has been discouraged and repressed. Education and culture for centuries were regarded as the special province of the schools and the church, both of which looked askance at the intrusion of science.

One of the first who dared experiment was Leonardo da Vinci, who, less than five hundred years ago, said, "The interpreter of the artifices of nature is experience, who is never deceived. We must begin from experiment and try to discover the reason." About two hundred years later, in the 17th century, a group of remarkable men appeared who began to use the experimental method. Their crude beginnings were the founding of modern science. They worked in the face of insuperable difficulties, often suffering martyrdom. Galileo was one of the first to use the experimental method. He studied the rate of falling bodies from the leaning tower of Pisa in 1589, and in 1611 invented the telescope.

While the Arabs are credited with the invention of our system of numeration, mathematics and the sciences based on that subject received great impetus from the work of Napier, who in 1614 published his work on logarithms. Three years later Henry Briggs improved Napier's work by devising the system of decimal notation. During this historic period trigonometry and algebra were developed, analytical geometry invented, differential calculus perfected, and the law of gravitation discovered. These profound contributions were basic to the later discoveries in the field of physics and chemistry. The immortal Harvey, who discovered the circulation of the blood in 1628, was the founder of modern experimental medicine. Since then the number of investigators has grown and the field of inquiry and experiment broadened.

For centuries predatory man has found it easier to wage wars of conquest and plunder on fortunate and thrifty neighbours than to battle with nature and the soil. The German Reich's Lebensraum means only that it covets the rich grain-producing lands and natural resources of other nations. However, today throughout the world, millions of people are either dying of starvation or living on subnormal subsistence. Recent reports tell of terrible famine conditions in China and India. There are countries, notably Japan, which are overpopulated, their inhabitants living in cruel poverty. Still other nations have no homeland. Yet there is an abundance of arable land on the earth awaiting only its development by man.

In the vast areas of South America drained by the Amazon and the Orinoco are lands lush with fertility. The same is true of the great regions of Africa drained by the Nile, the Niger, and the Congo. The development and use of these millions of square miles of forest jungle are made difficult or impossible at present by the myriads of insect and parasitic pests which are highly destructive to human life. Homelands of wealth and luxury on both of these continents for nations as large as Britain or the United States await the scientific research and resourcefulness of man.

How illogical and absurd is it for civilized peoples to engage in terrible wars of conquest,

for the specious reason that more living space is required when there is so much of the earth's surface that is not being used. What is true in this respect of South America and Africa is in large measure true of the other continents. Hunger and disease are the greatest foes of man, and, if he had any sense, man would recognize the fact and change his fighting front and tactics. The solution of the problem is one of scientific research. The world awaits another Gorgas and another Ross who, with the money which a single modern battleship costs, might find the answer.

It is comparatively easy to determine the food needs of a nation, but more difficult to estimate the total agricultural production necessary to supply optimal food consumption. It has been conservatively estimated that if all the good agricultural land in the world were to be cultivated by the best modern means it could adequately feed the total population of the world from two to twenty times over. In a study of nutrition in Britain, a relatively favoured country, prepared before the onset of the present war, it was revealed that half of the population suffered from deficient feeding and that one-fifth were below even minimal fitness and state of health. It is estimated that it would require not less than 20% more food than the British people now get to bring the whole population up to a normal standard. This is roughly three times more than the agricultural production before the war. Assuming the present population of Britain to be 44,000,000 and the pre-war cultivated area to be 12,000,000 acres, it would mean that a productive land area of 36,000,000 acres is needed to supply Britain's food. This is approximately an average of one acre per inhabitant. I am aware that in the present war emergency, soil cultivation in Britain has been increased and that food supplies are diminished. Using this British standard as an index, 2 billion acres would be needed to supply the inhabitants of the whole world with an adequate food supply. This 2 billion acres, however, is less than half of the present cultivated area of 4,200,000,000 acres; and this, in turn, is only 12% of the land surface of the world.

It is proper to ask why are these enormous areas uninhabited by man? The answer is mainly disease. Civilization had its origin in the tropics, but it was disease that drove man out to the colder temperate and arctic zones. Contrary to the former belief, General Gorgas, in his studies of yellow fever, proved that the white man can live with unusual vigour in the tropics, and also that while in the temperate zones man can with much labour grow but one crop a year, in the tropics he can raise two or even three crops a year and with less labour.

In the great emergency today scientific research is being actively promoted by all the warring nations, but prior to the onset of the conflict it was less highly regarded. For example, Britain begrudgingly devoted one-tenth of 1% of its national income to research, which is only 3% of what it spent on liquor, 2% of what it spent on tobacco, and 1% on gambling. The United States, with greater wealth, devoted 0.6% of its total income to research, but was more profligate with the vices. The Soviet Union, with broader vision, devoted 0.8% of its income to research, and in addition placed it on a far more efficient basis.

Let us see what research has accomplished for Russia. It should be remembered that Russia, culturally, is a very old nation. The University at Kiev was established more than a thousand years ago, yet for the most part under the Czars, Russia practically stood still up to the present century. An English investigator recently stated that Russia socially and intellectually in 1914 was at the cultural level of England in 1800, but that in the succeeding twenty-five years she had covered as much ground as had Britain in a century. Regardless of our views as to the implications of Russia's political philosophy, the student of scientific research would do well to study her achievements. As stated, the Soviet Union is devoting a far larger share of her total income to scientific and social research and education than any other nation in the world, ten times that of Britain, and 40% more than the wealthy United States. Most of what has been accomplished is the result of less than ten years' efforts. At the end of the first World War, Russia's large scale industries were practically destroyed, less than one-seventh of the pre-war state. By 1925 they had reached three-fourths of the pre-war level, but still were small. At the end of 1937 Soviet industry exceeded that of Great Britain and Germany, and was second only to the United States.

For example, in a little unheard-of region in the heart of Asia is located the Kirghizian Soviet Republic covering an area of about one-third the size of Ontario and with half the

population, which was almost entirely nomadic. It is surrounded by high mountains and traversed by deep river valleys. Until recently the country was inaccessible to travellers, for there were neither highways nor railroads. Fifteen years ago there were fewer than twenty-five miles of roads over which an auto could pass. Today there are more than 2,500 miles of motor highways. The country has become a beehive of industry, with great power plants, mines, sugar refineries, cotton mills, packing plants, and an enormous agricultural development. Where formerly they had none, they now have 1,500 schools, six higher institutions of learning attended by 300,000 students. All this is the result of recent scientific and social research.

The Turkmenian Soviet Republic is another example. Twenty-five years ago it was a poverty-stricken borderland. Only 1½% of its people attended school. It is now one of the leading Soviet states. Industrial and scientific research have revealed vast natural wealth. In this one state fifty research institutions have been established, employing five hundred scientists. These embrace botany, zoology, mineralogy, and industry. One institute is studying the problem of the practical utilization of the heat of the sun, especially important in water-distilling devices for arid areas. They have an institute of history, languages, and literature. They have created a grammar for the native language and also published two dictionaries. The capital city, Ashkabad, possesses a fine oriental museum.

In the far north within the arctic circle, wonders have been achieved in making this area habitable to man. Fuel deposits and mineral wealth have been discovered and developed. New sources of food have been found. The result is that what hitherto had been a vast desolate waste has now become the home of a vigorous people of industry and education. In the extreme south, research in plant breeding has been carried on with equally remarkable results. Progress has been made in the hybridization of tropical fruits like the citrus, and textile fibres like cotton, producing types which will grow in the cooler warm-temperate and semi-tropical areas.

In the Soviet Union there are sixty national groups, each with its own language. In addition there are a large number of tribal dialects with no written language, grammar, or alphabet. Research students in the field of education have now remedied this condition. Over 9 billion books have been published by the Soviet Union. Books are being published in one hundred languages, including forty which until recently had no alphabet. More copies of the works of Darwin and Shakespeare are printed and read in Russia than in Britain or the United States.

One could dwell at length on the achievements of the Russian medical scientists, but time will not permit. No country in the long history of civilization has made so much progress in so short a time as has the Soviet Union. And it has been achieved by the application of wisely directed, properly coordinated, liberally supported, scientific and social research. These accomplishments of Russia in taking poor, illiterate nomadic peoples of diverse race, language, customs, and tradition, and converting them into settled, prosperous, educated, industrial, and agricultural states is one of the greatest social accomplishments in all human history. Their conquest of nature in making habitable for man vast tracts of land hitherto unsuited for human life is little less notable. In their post-war planning the great white races of the world with their vaunted spiritual, cultural, and technical resources would do well to pause and contemplate these achievements of the Soviet Union.

Practically all wars of the past have ended with peace treaties frequently motivated by hate and lust for power and dominion, to be succeeded by other wars which have terminated either in extinction of nations, or still more wars. The Soviet Union has successfully conducted a full-scale experiment in scientific and social research which should receive the thoughtful attention of future treaty makers as well as the thinking people of the world.

Let us turn now from the material accomplishments of technical and social research and give consideration to that which has to do with medical science. Everyone is familiar with the great improvement in public health which has taken place in the last fifty years. The eradication or control of the communicable diseases of childhood and the water and milk-borne infections accounts for most of the gain. However, there remains a large number of so-called degenerative diseases which are still largely un-

solved. These include cancer, the cardiovascular-renal diseases, and the disorders of the endocrine glands. Mortality statistics do not reveal the true picture because there is a vast amount of disabling but non-fatal illness. These non-infectious diseases, which today are the chief causes of death and against which we have made little progress, offer an unlimited field for medical research.

How should this task be approached? At the present time a large part of medical budgets is expended in treating afflicted patients, a considerable portion is spent in clinical research which consists in observing and classifying the passing phenomena of the disease, a sort of factual or statistical compilation which may or may not contribute to the elucidation of the underlying principles involved. According to Sir Frederick Hopkins, this type of research is greatly over-rated as a scientific procedure. He believes that, if progress is to be made, the emphasis should be placed on pure research and in the newer fields of science, namely biophysics and biochemistry. He goes on to say that descriptive and morphological studies of disease structures serve mainly for purposes of classification and that studies of function and the endeavour to correlate this with structure, too, have limited usefulness. We must go far beyond these stages of investigation, however, and look beneath the surface of the cell and think in terms of molecular events. He postulates that, in the future, disease will be viewed from a new standpoint and that even now those who think in terms of molecular events may have visions of progress denied to those whose thought is guided by the visible alone.

We are now entering a new era in which it is to be hoped that scientific research, including that which has to do with medicine, will be the main function of the worker who will possess the requisite preliminary training and will be afforded the facilities for continuing progress. In such a program pure or abstract research, the study of principles will play a much larger part than it now does, and less attention will be paid to the so-called practical studies, the gathering of ever-changing facts.

Research of the future, to be effective and useful, should be planned as a long-range project to be undertaken only by those with the proper training who are willing to dedicate years of their lives to efforts which may prove to be fruitless. It, of course, must be well conceived and well supported. We should encourage those who are best fitted for the purely scientific work, and we should also try to bring the practical results of science into the lives of our people. We should teach them to think objectively in terms of science and, as we succeed in so doing, fads and "isms" will disappear. Everyone should know as much about science as possible as it affects him individually.

The physician in such a plan would serve a dual function. He might serve as a sort of assistant to the pure scientist, observing and recording phenomena in his daily practice; secondly, acting as an interpreter of science to the public at large. Many schemes for the improvement of medical care have been proposed under the name of socialized medicine, but I am confident that that one which promotes the extension of research and provides for its broadest application not only will be the wisest, but it also will be the plan most likely to succeed. The valuable part the general physician can play is well illustrated by the life of Sir James Mackenzie, who devoted most of his life to general practice in the country, but who by self-training became an accomplished scientist.

Charles F. Kettering, the brilliant director of research for the General Motors Company, has an abiding faith in people of ordinary abilities. In a recent radio address he said,

> "Intellectual prodigies are rare; each generation produces some, but most of the world's work is done by people like ourselves with just ordinary abilities who may reach positions of excellence or responsibilities by practice, study, and plain persistence. More is accomplished when men work in groups or an organization. There is nothing magical about research. It is not necessary to have expensive apparatus or elaborate buildings. Actually, research isn't a physical thing at all, just a state of mind. It is an intense desire to do something. The process is so simple that anyone can do research anywhere, at any time. First you select the problem you would like to solve. Then you list ten obstacles that may be encountered. In picking the problem, be sure that it is worth the effort. It takes just as much effort to solve a useless problem as a good one. Next you start testing the ten obstacles that you must overcome. Take the easy ones first, and by a process of elimination you at last arrive at the one or two major obstacles. You may need some apparatus for these, but the things you will probably need most are infinite patience and persistence. Few people realize how difficult it is to do any new thing and they quit before the job is finished. We get discouraged too easily. In school we are examined two or three tmes a year. If we fail, we are out. In contrast, most research is 99% failure, and if we succeed once, we are in."

I have quoted Mr. Kettering at length because his leadership in the field of industrial research has brought about remarkable achieve-

ments. Leadership is important beyond exaggeration. The selection of leaders is perhaps the greatest accomplishment of all. Sir Humphrey Davy once said his greatest discovery was Michael Faraday. And Davy himself is said to have been the chief discovery of Benjamin Thompson, or Count Rumford. History is full of similar examples.

The great technical industries of America owe much of their success to research. All of them watch the progress and inclinations of the students in the technical schools. Any boy who shows evidence of promise even in his freshman year is encouraged in practical ways. The industries are particularly interested in well-trained young men. It is their experience that the mind of youth is more flexible, imaginative, more vigorous, and more amenable to direction. Old men are eased out or put into positions where they may not retard progress. None of these companies looks for geniuses, but rather for young men of good training and with the aptitudes for scientific work. If a genius is discovered, it is a piece of rare good fortune.

I have dealt at length with this analogy from industry because I believe the same principles can be applied with equal force to the science of medicine. It is the task of the university, the medical school, and the medical profession to raise the standards of medical practice and to conquer or solve the several dreadful maladies which impose such a burden on humanity. The university is confronted with the problem of preparatory education. Is the plan which we now follow a wise one or the best? The experiment which Dr. Robert M. Hutchins is undertaking at the University of Chicago is an intriguing one. Time will not permit a discussion of his views or the methods employed. It is sufficient to say that he believes there is much waste of time and effort, and misdirection in our current educational programs. Briefly, he believes that students should be taught to think about the most important questions, the aims and possibilities of human life and of organized society. His curriculum is composed of the great books, the great experiments, and the liberal arts, that is, language and mathematics. He holds that preliminary collegiate education should be begun and completed at a much earlier age than it now is. Under such a plan the student would begin his professional training and enter a career earlier in life with greater vigour and enthusiasm.

To return to the problem of the improvement in medical practice, it would seem in the light of recent experience that the first step is the promotion of research as rapidly, as extensively, and as wisely, as possible. This should be done through the universities and their medical schools in co-operation with organized medicine. Research as a permanent career for young men should be provided and encouraged. Next, the value of such research should be carried to the people in a never-ceasing program. The scientist should be willing to come down from his ivory tower, unbend and discuss his work with the common folk because they make up the bulk of the population and pay most of the taxes. An idea or an institution can have no greater stimulus or support than the interest of the common people. The practising physician should enjoy the confidence and give such assistance as may be possible to the research movement. He should be the scientific interpreter to the public. His affiliation with a university research activity would add dignity to his stature and breadth to his training. He would be more of a thinker and less of a dispensing clerk. This education of the public and the doctor in the significance of research would also have its value in gaining the support of politicians or officials in charge of the appropriation of funds. One cannot expect enthusiastic financial aid from administrative officials for the support of a nebulous project of which they know nothing and in which they have no interest.

Four years ago we undertook an experiment in Rochester which merits a brief description. The Academy of Medicine established a medical museum for the purpose of illustrating current medical progress. For purposes of guidance, technical and material assistance, it was made a division of the Rochester Museum of Arts and Sciences. The faculty members of the University of Rochester Medical School and the Department of Public Health became active supporters.

The method of operation was as follows. In a large room in the Academy, especially built and equipped for the purpose, exhibits of various kinds are prepared illustrating investigations under way or completed, or new conceptions of old problems. At the beginning of the year the committee in charge, after a preliminary survey, decide what problems could best be presented. Often the subjects selected

related to the themes to be given as lectures by distinguished guest speakers during the season. For example, on one occasion diseases of the heart was chosen. A committee of more than twenty doctors was selected under the leadership of a qualified specialist. This group spent several weeks in preparation. One subcommittee developed the history; another arranged exhibits of literature; others dealt with pathology, diagnostic methods, and therapeutic procedures. Running concurrently were other exhibitions and demonstrations. In one year one hundred and eighty-five doctors participated in this museum activity. These exhibits have an interest value in point of time of about two months, during which all of the doctors of the community have an opportunity of examining and studying them several times. They are then replaced by other exhibits or demonstrations. On advertised dates the museum is open to the public, and the exhibitors act as guides or docents. Medical students, interns, dietitians, nurses, boy scout groups, hygiene classes from schools, teachers, and social workers are invited when the exhibits have special interest for them. We have found by experience that both the public and the medical profession are more interested in the museum than they are in the platform speaker. In fact, we find it necessary to close the musium in order to get an audience for the lecture. It is interesting, too, that we have had a good deal of voluntary financial support from laymen. Unfortunately, because of lack of fuel and for other reasons brought about by the war emergency, we have not been able to operate the museum during the past year. This undertaking is purely an experiment. It is too soon to evaluate its worth.

A final word about the museum room. It is really beautiful, having been decorated for us by the Federal Arts Project. Around the side walls next to the ceiling runs a frieze made up of twenty-six panels. On these are engrossed the names and deeds of scientists of North America who have made notable contributions in the field of medicine. On one of these panels appear the names of Banting and Best; on another that of Osler. At the far end of the room is a large mural which depicts some of the great characters of history, including Pasteur, Jenner, Lister, Osler, and Banting. In one part of the mural is shown suffering humanity, and in the other, science wrestling with the problems of disease.

I have been told that it is contemplated to have a memorial room for Dr. Banting in your university. I can think of no more useful one than a teaching museum which would carry the message of medical science to all the people.

Everyone now is looking forward to the successful termination of the present terrible war. At its conclusion the people of the whole world will be faced with the problem of reconstruction. We shall be concerned not only with our own problems but also with those of our enemies. We shall have vanquished the armies of the axis nations, but the two greatest foes of man, starvation and disease, will remain unconquered, later to tempt and lead man to other and more ferocious wars. Let us hope and pray that those who direct our destinies will have the wisdom to see the value of scientific research; research directed toward the rehabilitation of the earth which has either been despoiled by foolish warring man, or is uninhabitable because of pestilence; research directed toward the eradication of disease which cripples or destroys such a large part of our useful population. In this the medical profession should play the leading part. Physicians should not be the subordinates of social workers or political directors. They should be the interpreters of medical science and the leaders in public health movements. They should be the missionaries and proponents of medical research. The doctor and the research scientist, thus working hand in hand, could contribute much to the future happiness and security of mankind.

I feel strongly that this thought was ever in the mind of Frederick Banting. I am sure that his spirit is with us today and that this message has his approving benediction.

His was a great soul. His memory will never die.

"They are not dead who live
In hearts they leave behind.
In those whom they have blessed
They live a life again
And shall live through the years
Eternal life, and grow
Each day more beautiful
As time declares their good,
Forgets the rest, and proves
Their immortality." Orr

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RÉSUMÉ

La médecine doit à Banting, non seulement la découverte de l'insuline, mais aussi la stimulation du goût pour la recherche scientifique. La fondation de l'Institut Banting pour la recherche médicale a peut-être été la plus grande récompense de son fondateur.

La méthode scientifique date de 4241 av.J.C. C'est très récent par rapport aux 350,000 ans où rien n'avait été noté par l'homme depuis son apparition sur la terre. Plus près de nous, Léonard de Vinci est le premier qui a osé utiliser la méthode expérimentale, puis vinrent les savants du 17ième siècle, véritables fondateurs de la science moderne. La terre, pourtant petite, peut encore produire énormement si on la débarrasse des parasites qui menacent constamment l'être humain: on attend pour cela la fin de la guerre et l'amélioration de l'armement scientifique. La plus grande partie de la terre est inhabitée à cause des maladies qui sévissent en ces endroits fermés à toute pénétration scientifique. Le savant d'aujourd'hui doit combler cette lacune et augmenter la superficie terrestre habitable. La Russie a déjà travaillé dans ce sens de façon fort encourageante; ses progrès en médecine dépassent toutes les expectatives. On sait les progrès accomplis à travers le monde dans le domaine de l'hygiène et des maladies contagieuses; il reste cependant beaucoup à faire, notamment au sujet du cancer, des maladies cardio-vasculaires et des troubles endocriniens. Ces états morbides seront combattus par la recherche scientifique et l'élargissement des budgets universitaires à cette fin. Les plus grandes industries d'Amérique doivent leur succès à la recherche scientifique. Les mêmes principes sont appliquables à la médecine. Enfin, il importe de tenir le public au courant des progrès accomplis par la science afin qu'il devienne davantage le collaborateur et l'ami du savant.

JEAN SAUCIER

The five most common causes of the deaths of school children in the United States are, in the order named, accidents, appendicitis, influenza and pneumonia, rheumatic fever, and tuberculosis.

FURTHER STUDIES ON THE RELATIONSHIP OF CORNEAL VASCULARIZATION TO RIBOFLAVIN DEFICIENCY*

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IN a previous communication,[1] the effect of riboflavin on corneal vascularization and symptoms of eye fatigue in the R.C.A.F. was discussed. It was pointed out that, in three respects, the subjects used for this study were not chosen at random from R.C.A.F. personnel: (*a*) They were receiving an amount of riboflavin in their daily diet which is generally accepted as inadequate[2, 3] (1.0 to 1.6 mgm. per day). (*b*) They were subjected to glare in their long aerial patrols. It is not as yet known what association exists between the amount of glare and riboflavin needs, but it is known that riboflavin is destroyed by light. (*c*) They represented the most advanced stages of corneal vascularization among some 200 men examined.

A special ophthalmic camera had been devised to insure accurate and permanent records of any vascularization encountered. In the group receiving a supplement of 9.9 mgm. of riboflavin daily over a period of two months, a rather marked improvement occurred in the photographic record of corneal vascularization and in symptoms of eye fatigue. No such improvement occurred in the group which received a placebo of similar appearance.

The present study has been undertaken to determine whether or not a slit lamp examination and the photographic procedure give comparable data, and to throw further light on the effect of riboflavin on corneal vascularization and symptoms of eye fatigue.

A. COMPARISON OF PHOTOGRAPHIC AND SLIT LAMP EXAMINATIONS

Methods.—The right eyes of nine subjects were photographed and the photographs immediately developed. The same eye of each subject then

* Reported to the Associate Committee on Aviation Medical Research, National Research Council, June 1, 1944.

was examined with the slit lamp, and the results were compared with the photographic record. The stage of vascularization of the cornea, as determined by each method was recorded. Also detailed comparisons were made regarding the character of the vascular system as seen by each method.

Results.—As a result of the comparisons made, it can be stated that the photographic record of the blood containing vessels is identical with the slit lamp findings. However, vessels which do not contain blood are more difficult to see in photographs than with slit lamp examination.

Discussion. — In order to insure adequate visualization of the collapsed blood vessels retro-illumination is required, which is not possible with the photographic technique. Also with black and white photographs the corneo-scleral transition zone is almost indiscernible from the cornea proper, thus making assessment of the extent of invasion in relation to this zone difficult. The corneo-scleral transition zone is the area where a diminishing thickness of sclera overlies the cornea. As a result, this zone is opaque at its scleral side and transparent at its corneal side. Histologically the cornea is set into the sclera like a watch glass, the sclera overlapping the cornea all around the periphery. Many people feel that vascularization in this transitional zone is a normal phenomenon.[4] In the photographs it is difficult to distinguish between vascularization in this zone and that in the cornea proper. One great advantage, however, in the photographic technique is that it provides a permanent record of blood-containing vessels, thus making possible accurate comparison of changes over any period. Also the blood-containing vessels usually can be more easily seen in the photograph than by the slit lamp even in the hands of an experienced operator.

B. THE EFFECT OF RIBOFLAVIN ON CORNEAL VASCULARIZATION

Methods.—A group of students in the photographic division of the R.C.A.F. were selected for this study. They were of both sexes and represented two consecutive classes under instruction. Their work was largely indoors. Thus, they contrasted with the subjects of the previous report regarding exposure to glare. Further, the subjects of this study for a year had been on the new R.C.A.F. ration which assays approximately 2.9 mgm. of riboflavin as served. The Food and Nutrition Board of the National Research Council[2] and the Canadian Council on Nutrition[3] suggest 2.7 mgm. of riboflavin as the recommended daily allowance. This group of subjects, numbering 41, was examined by the two methods. Slit lamp examination was carried out by an ophthalmologist, one of the authors of this paper (J.V.V.N.). In the photographic procedure the R.C.A.F. ophthalmic camera was used as outlined in the previous paper.[1] A careful history was taken of the following symptoms: photophobia, lacrimation, burning of eyes, eye fatigue and headache on reading and blurring of vision. The subjects, as stated, belonged to two classes under instruction, one was given a supplement of 3.3 mgm. of riboflavin three times a day, and the other was given a placebo of similar appearance.

Treatment was continued over a period of two months, the longest period that the subjects were available owing to service conditions. Photographs were taken every two weeks. At the conclusion of the two month period the subjects were questioned carefully regarding changes in symptoms, a second slit lamp examination was made, and final photographs were taken. The final slit lamp examination was carried out without reference to the findings of the first examination, or the identity of the individual, or the group to which he belonged. Subsequently, the photographs taken before, during and after treatment were examined. Only after this examination was completed and recorded did the examiners know which subjects had received supplementary riboflavin and which had received placebos.

The results of the initial and final slit lamp examination were recorded according to the following classification:

Stage 0—In which blood-containing vessels did not extend beyond the sclera proper into the transition zone.

Stage 1—in which the blood-containing vessels extended into the transition zone but not into the cornea proper.

Stage 2—in which the blood-containing vessels extended into the transition zone with twigs into the cornea proper.

Stage 3—in which the blood-containing vessels extended into the cornea proper with the formation of loops in this structure.

In the photographic technique a direct comparison was made between the various photographs taken throughout the study.

Results.—In Table I is recorded the incidence and degree of corneal vascularization in the treated and untreated groups at the time of the initial slit lamp examination.

The results of the slit lamp examinations appear in Table II, and of the photographic survey in Table III. It will be noted that no significant statistical difference (criteria of significance, $p = 0.5$) occurred between the treated and the untreated groups over a period of two months, no matter which type of examination was used. Certain of the subjects in both groups improved, some remained unchanged, and others became worse. Certain minor changes could occur which would not be detected by the slit lamp technique. For instance, a subject classified as Stage 2 on the initial examination with numerous vascular twigs extending into the cornea proper, might on the final examination show a reduction in the number of such twigs. Yet such a change would still be classified as Stage 2 by the slit lamp technique and thus not indicate any improvement. On the other hand, these changes would be seen readily in the photographic records, and an improvement recorded.

TABLE I.

INCIDENCE AND DEGREE OF CORNEAL VASCULARIZATION AT INITIAL SLIT LAMP EXAMINATION

Type of case	*Stage 0*	*Stage 1*	*Stage 2*	*Stage 3*	*Total*
Treated...	2	15	8	0	25
Untreated.	1	4	10	1	16
Total.....	3	19	18	1	41

TABLE II.

RESULTS OF SLIT LAMP EXAMINATIONS

	Improved		*Unchanged*		*Worse*		*Total*	
Type of case	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
Treated....	7	28	11	44	7	28	25	100
Untreated..	5	31	5	31	6	38	16	100

TABLE III.

RESULTS OF PHOTOGRAPHIC EXAMINATIONS

	Improved		*Unchanged*		*Worse*		*Total*	
Type of case	*No.*	*%*	*No.*	*%*	*No.*	*%*	*No.*	*%*
Treated....	12	48	6	24	7	28	25	100
Untreated..	7	44	5	31	4	25	16	100

TABLE IV.

CHANGES IN SYMPTOMS

Type of case	*Total No.*	*No. having symptoms*	*Improved*	*Unchanged*	*Worse*
Treated.....	25	23	5	18	0
Untreated....	16	7	0	5	2

In Table IV the record of changes in symptoms in the two groups is set forth. While considerable caution must be exercised in attempting to assess these changes, it is of interest, but not statistically significant, that five of the treated group claimed improvement in symptoms whereas none of the untreated group noted any such change. The high incidence of symptoms is noteworthy. This incidence may present an exaggerated picture owing to the fact that leading and specific questions were asked. A similar high incidence of such symptoms was encountered in the first study.[1]

A study was made of the photographs of the eyes and the record of symptoms. No correlation could be established in these subjects between any changes in the corneal vascularization and the presence or absence of eye symptoms. As will be evident from the following discussion, this finding could have been expected.

Discussion.—Recently, the Conference on Methods and Procedures for Nutritional Survey[5] stated that "Characteristic capillary invasion of the cornea is an index of riboflavin deficiency, and it is recommended that this examination (slit lamp and biomicroscopic examination) be used in group assessments of nutritional status".

The relation between the presence of blood-containing vessels in the corneo-scleral transition zone and riboflavin deficiency is not settled to the satisfaction of all observers. In the cornea proper, however, the presence of blood-filled vessels is generally considered to be abnormal, and one cause of this abnormality is deficiency of riboflavin.[6] As pointed out by Ferguson[4] corneal vascularization due to riboflavin deficiency is not localized but tends to be uniform around the circumference of the cornea. On the other hand, as is well-known, trauma, pannus, trachoma, and corneal ulcers produce vascularization which tends to be localized.

In the subjects studied, such vascularization as was present was of a uniform nature around the cornea and therefore could have been due to riboflavin lack. However, the administration of 9.9 mgm. of riboflavin per day for a period of two months did not result in any consistent change in the vascularity of the peripheral region of the cornea. It should be pointed out, however, that the subjects studied had received in their diet for a period of a year an amount of riboflavin considered to be quite adequate for health. Further, this study covered a period of two months only. Kruse[7] has postulated that certain cases of corneal vascularization require treatment with large amounts of riboflavin for many months before changes can be expected.

Jolliffe[8] states that in dietary deficiencies morphological changes in the tissues are usually preceded by biochemical changes and impairment of function. According to this theory, with a lowered intake of riboflavin, one would expect the development of biochemical changes such as a decreased concentration of riboflavin in the urine, blood and tissues, and the development of symptoms, before the appearance of morphological changes, such as corneal vascularization. On the administration of therapeutic amounts of riboflavin, one would expect the sequence of events would be reversed, the riboflavin content of the blood, urine and tissues tending to revert to normal and the symptoms to disappear. Later, if irreversible morphological changes had not taken place in the tissues, they also would be expected to return to normal. Evidence supporting this sequence of events was reported in the previous study[1] when, after the administration of riboflavin the symptoms of watering of the eyes, burning of the eyes, and eye-strain disappeared in many instances before the disappearance of the blood in corneal blood vessels.

Fig. 1

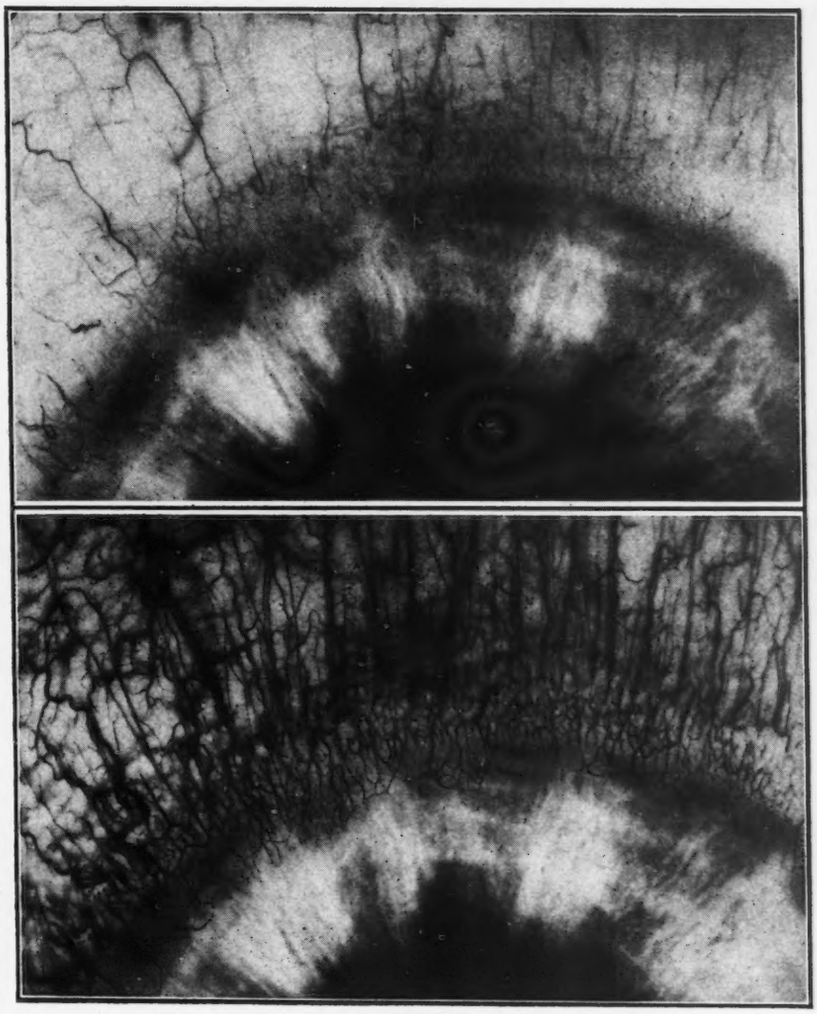

Fig. 2

Fig. 1.—Photograph of eye showing limbal region.
Fig. 2.—Photograph of same region of same eye 5 minutes later. A soap solution had been instilled in the conjunctival sac immediately after the first photograph (Fig. 1) had been taken.

Whether it is possible to reverse completely the pathological process and have the empty blood vessels absorbed is, in the clinical experience of one of the authors (J.V.V.N.), extremely doubtful. Once the cornea has been invaded by blood vessels and then for whatever reason has become avascular, a temporary lack of riboflavin can cause these blood vessels to be filled again with blood. Also, irritation such as glare, smoke, dust and eyestrain may suddenly cause many such vessels to become functional again for the duration of the inflammatory reaction. This is amply demonstrated by the instillation of a simple irritant such as a soap solution, 25 grains to the ounce of distilled water (Figs. 1 and 2). Examination of the two figures reveals that immediately before the instillation of the irritant many of the blood vessels were

collapsed, afunctional and therefore invisible, or poorly visible by the photographic technique. However, in the short period of 5 minutes after the instillation of the irritant collapsed blood vessels not only in the cornea and the transition zone but also in the conjunctiva have become engorged and plainly visible.

It is interesting to speculate whether adequate amounts of riboflavin over a sufficient period might reduce the effect of irritants but it would appear most unlikely that such effects could be prevented completely if the irritant was very severe. It would be surprising if the ocular irritants which are encountered in every day life from time to time would not in themselves be sufficient to keep the vessels patent. So far as this study shows, it seems that a uniform peripheral corneal vascularization is not a safe basis for a diagnosis of riboflavin deficiency existing at the time of examination. Such a lesion may be due to riboflavin deficiency, but the deficiency could have occurred at any time previous to the examination. Also these blood vessels could have been reactivated by some cause other than a lack of riboflavin, such as a local irritant. It is obvious that further investigation is necessary to set out clearly the conditions under which riboflavin therapy is indicated.

SUMMARY

1. The results obtained from photographing the corneo-scleral junction with the R.C.A.F. ophthalmic camera and by an examination with a slit lamp are not significantly different.

2. A study to demonstrate the effect of riboflavin on corneal vascularization has been carried out using both photography and the slit lamp examination. The subjects studied were 41 individuals who had been provided with a ration containing when served 2.9 mgm. of riboflavin per day for a period of one year. Approximately one-half of the subjects were given a supplement of 3.3 mgm. of riboflavin three times a day for two months and the others received placebos. Under the conditions of this study there was no consistent change in corneal vascularization in either the treated subjects or the controls.

3. The instillation of a simple irritant in the conjunctival sac caused collapsed, afunctional blood vessels in the cornea, transitional zone and conjunctiva to become engorged.

4. So far as this study shows, it seems that a uniform peripheral corneal vascularization is not a safe basis for a diagnosis of riboflavin deficiency existing at the time of examination. Such a lesion may be due to riboflavin deficiency but the deficiency could have occurred at any time previous to the examination. Also these blood vessels could have been reactivated by some cause other than lack of riboflavin.

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RÉSUMÉ

Que la jonction cornéo-sclérale soit photographiée ou examinée à la lampe à fente, les résultats consignés par l'examinateur sont sensiblement les mêmes. Par cette double méthode d'examen, 41 sujets ont été étudiés. Ceux-ci avaient été soumis pendant un an à la ration quotidienne de 2.9 mg. de riboflavine. Environ la moitié des sujets reçut en supplément 3.3 mg. de riboflavine 3 f.p.j. pendant 2 mois tandis que l'autre moitié recevait des placébos. On n'observa aucune différence de vascularisation dans les deux groupes. On a noté qu'un irritant: une solution de 25 grs de savon dans une once d'eau distillée, instillée dans le sac conjonctival provoquait l'engorgement des vaisseaux de la cornée, de la jonction cornéo-sclérale et de la conjonctive quand ces vaisseaux étaient préalablement collabés. L'examen de la vascularisation cornéenne est insuffisant à lui seul pour diagnostiquer la carence de la ribloflavine.

JEAN SAUCIER

Like the prevention of tuberculosis, it would seem that prevention of rheumatism is a social-economic problem. The sooner we can provide adequate housing and proper nutrition for the economically necessitous groups, the sooner will the problem of rheumatic disease be solved.—R. R. Struthers, *Canad. J. Pub. Health*, 1944, **35**: 119.

THE CLOSED PLASTER METHOD IN THE PREVENTION OF SHOCK AFTER BURNS*

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IN the past decade plaster casts have been used clinically in the treatment of burns by Lohr,[1] Roulston,[2] Stonham,[3] Trueta,[4] Logie,[5] Cohen,[6] Zeno,[7] Barnes[8] and Levenson and Lund.[9] The technique of application has varied widely. Most of the workers cited considered that rest and protection of the burned part were the principal desiderata. Levenson and Lund, following the experimental work of Drinker and his associates,[10] applied skin tight plaster casts as soon as possible after burning, with the object of preventing swelling.

Immediate application of plaster has proved to be of definite value as a local treatment in experimental burns.[11] It was therefore considered desirable to find the effect of closed plaster treatment on hæmoconcentration and on the production of shock. To this end a standard burn was produced on the extremities of anæsthetized dogs of such a nature that death occurred in over 50% of cases. It was shown[12] that when plastering was carried out immediately after the burn mortality from shock was markedly reduced. If plastering was carried high above the burn, no appreciable hæmoconcentration occurred, although when this was not possible owing to the extent of the burn, some hæmoconcentration took place. Another series of experiments have been performed designed to show whether any benefit in this respect can be derived from later application of plaster, or from "pressure" dressings.

Experimental Methods

Forty-two healthy mongrel dogs of approximately the same size and shape were used as experimental animals. Under sodium pentobarbital anæsthesia a "15%" burn was produced on the four limbs of each dog. An adaptation of the method suggested by Glenn which consisted of plunging the limbs of a dog into water at 100° C. for one minute, was used in all cases. The area for a "15%" burn was obtained by immersing the legs in water until a volume of water equal to 15% of the weight of the animal had been displaced. These levels were then marked with indelible pencil. A 15% burn in dogs of the size used covers approximately 35% of the body surface. This was determined by actual surface measurement of the limbs and the use of Rübner's formula for total surface area. The method has been more completely described elsewhere.[12]

For treatment the dogs were divided into 4 groups of 8 and 1 group of 10 dogs. In the first group an interval of one hour was allowed to elapse after burning before the application of plaster bandages. In the second, two hours, and in the third, four hours elapsed before treatment. The fourth group was an untreated control. The fifth was treated using pressure dressings.

As previously described, it was found that with this degree of burn, and under the conditions of our experiments, practically all untreated animals dying from shock did so within twenty-four hours. Due to the hazard of infection and difficulty of adequate nursing care, all animals in this study were observed for only 48 hours and then deeply anæsthetized and sacrificed.

Pressure dressings were applied immediately after burning. The technique used followed that of Koch. Cotton waste was applied around the limbs and fixed in place with gauze bandages. The gauze bandages were applied with considerable tension so that an equal pressure was exerted over the burned area. Approximately ¾ of an inch of packed waste separated the gauze from the limb.

In every case hæmoconcentration was followed by hourly hæmoglobin and hæmatocrit readings. In this study the specific gravity method described by Van Slyke *et al.*[13] was used to obtain the readings. These were checked periodically by the Sahli method for hæmoglobin and the Wintrobe method for hæmatocrit readings. The two procedures appeared to give comparable readings in these experiments.

Results

1. The mortality table (Table I) shows that if plaster is applied one hour after the burn, there is a significant decrease in the mortality rate. After this period the mortality rate approaches the control figures.

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2. The hæmoconcentration curves (Fig. 1) show that the average hæmoconcentration is less in the group plastered after one hour than in the control group, while in the two and four hour groups the rise in hæmoglobin approaches the figures obtained from the control animals.

TABLE I.

15% *burn*	*Died*	*Lived*
Control	10	8
0 hour plaster	0*	8
1 hour plaster	1	7
2 hour plaster	3	5
4 hour plaster	2	6

* Previous series.

When plaster is applied immediately, or within one hour after burning, a considerable decrease in mortality rate occurs.

TABLE II.

15% *burn*	*Died*	*Lived*
Control	10	8
Plaster treatment	0	8
Pressure treatment	6	4

The table shows the comparative mortality rates between the control, plaster treated and pressure dressing treated groups.

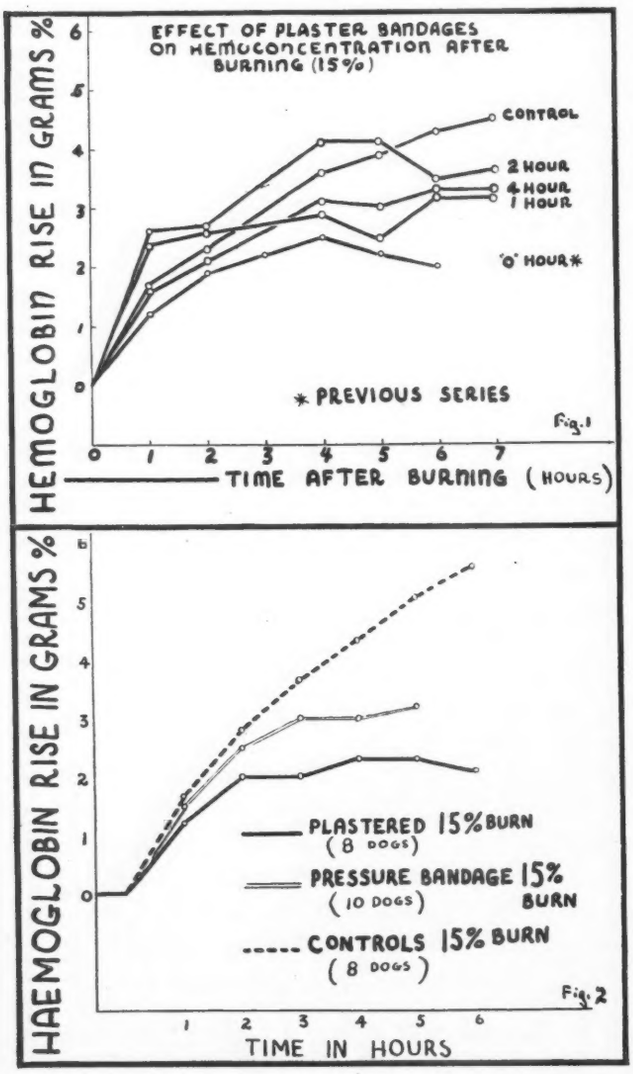

Fig. 1.—The average hæmoglobin reading is less in the groups treated by plaster application within one hour after burning. Fig. 2.—These hæmoconcentration curves show the comparative hæmoconcentration in the control, pressure dressing and plaster group.

3. The mortality table (Table II) shows the comparative mortality rates between the control, plaster, and pressure dressing treated groups. When appropriate statistical tests are applied* a significant difference can be shown to exist between the mortality rates for the plaster, and the control and pressure dressing groups. No significant difference between these latter two groups can be shown.

4. The hæmoconcentration curves (Fig. 2) illustrate the comparative hæmoconcentrations found in the control, pressure dressing and plaster groups.

5. As in former experiments, dogs treated by plaster application showed no evidence of pain or discomfort after the effects of the anæsthetic had passed off.

6. Pathological findings resembled those described in earlier experiments. The method of burning produces a third degree burn. Although islets of dermal cells in the hair follicles and papillæ can be seen when sections are examined microscopically, it is likely that these have been fixed by heat. The temperature under the skin gradually rises to a point between 60 and 70° C. at the end of the 60-second period of burning.

DISCUSSION

Greatly increased permeability of blood capillaries with subsequent loss of fluid into the tissues has been recognized as a factor of prime importance in the physiology of burns. Underhill[14] and many other workers have emphasized the systemic effects of plasma loss through hyperpermeable capillaries. The large amount of fluid lost in the region of the burn with a possible insidious, less dramatic loss in other parts of the body undoubtedly contributes greatly to the production of shock and death after a severe burn.

The success of fluid and latterly serum or plasma infusions in the treatment of shock after burns is good evidence that a reasonably normal distribution of the circulating blood can be maintained by replacement therapy of this type. Indiscriminate use of solutions of crystalloids, or even of serum, while the capillaries in the

* Chi square test. The exact treatment of 2 x 2 tables. R. A. Fisher, Statistical Methods for Research Workers, Oliver and Boyd, Edinburgh, 1941, p. 94.

injured area remain hyperpermeable will result in increased loss of fluid at the site of injury. Glenn, Gilbert and Drinker[10] have pointed out that the dilated capillary bed of a burned area forms a "leaky" reservoir of large capacity.

The systemic effects of plasma loss are of such importance that there has been a tendency to lose sight of the local effects on healing of a large amount of coagulated extra-vascular exudate.

Glenn and Drinker with their associates,[10] have investigated the effect of applying plaster casts without any initial compression over experimentally burned extremities. They have shown that the circulation under a cast is maintained in a satisfactory condition. Experiments on lymph flow, the transference of dye from blood to lymph fluid, and estimations of arterial and venous oxygen in the casted extremity all indicate that when an entire extremity is plastered, a skin tight cast does not injure the circulation. In their experiments healing took place more rapidly and with less deformity than in control animals where capillary leakage was unrestrained. From their work it seems apparent that the accumulation of clotted, extravascular fluid impedes healing and may form a favourable nidus for infection. This experimental work extends and confirms the principles for the treatment of infected wounds laid down by Winnett Orr[15] and amplified by Blair,[16] Trueta,[17] Allen and Koch[18] and others. Evidence is presented which suggested that due to the incompressible medium between blood vessels and the rigid cast, the cast "becomes in fact the capillary wall and thus meets the necessities of the situation physiologically".

A possible explanation of the systemic effect of closed plaster treatment in lowering mortality is to attribute the reduction to the decreased local loss of fluid. The marked decrease in hæmoconcentration tends to support this contention. However, Barnes and Trueta[19] have shown that the absorption of bacterial toxins, snake venom, strychnine and tetanus toxin, injected subcutaneously is slowed by immobilization in plaster. After such treatment lethal doses of these substances fail to cause death. It is quite possible that decreased absorption from the burned area might explain in part the decreased hæmoconcentration and mortality rate.

The results of the experiments reported seem to indicate that some benefit in the prevention of fluid loss and production of shock may be expected provided plaster is applied within an hour or two after the burn. The results suggest that early application of plaster is preferable in this respect to pressure dressings. In the experiments, pressure dressings were applied immediately after burning. The mortality rates reported for plaster application after 2 or 4 hours do not differ significantly from the control rates. If the numbers in the series were increased, it is possible that a difference might be demonstrated.

The technical difficulty of applying pressure dressings with uniform pressure over an extensive burn was great when compared with the ease of applying plaster bandages.

Another point has been emphasized by Glenn and his co-workers. The results of experiments carried out with animals under laboratory conditions cannot be applied directly to clinical problems. Clinical application of conclusions drawn from the experiments reported and those of Glenn and Drinker should only be made "if seasoned with the judgment that transition always requires".

Summary and Conclusions

1. Experiments have been described on the prevention of shock after burns by the immediate and later application of plaster of Paris bandages without any initial compression.

2. The immediate application of pressure dressings after burning has been compared with the plaster treatment.

3. Immediate application of plaster bandages decreases the mortality rate and hæmoconcentration to a marked degree. Some benefit in this respect accrues from application within 1 hour.

4. Immediate application of plaster is more effective in decreasing the mortality rate from shock than is the immediate application of pressure dressings, when the technique described is followed.

5. As these experiments were performed using animals, and under laboratory conditions, conclusions drawn from them should be accepted with reservations as to direct clinical application.

The authors appreciate the interest and valuable advice of Surgeon Captain C. H. Best, R.C.N.V.R., Director of the R.C.N. Medical Research Unit and Banting and Best Department of Medical Research.

The advice and comments of Dr. R. M. Wansbrough of the Sick Children's Hospital, and of Dr. D. B. DeLury of the Department of Mathematics, University of Toronto, have been of great assistance.

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WARTIME PRESSURES*

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I THINK that one of the simplest ways of putting before you the extraordinarily fascinating array of problems arising in the social organizations of modern industrial nations engaged in war is by telling the story of what has been done and what has been attempted.

At the outbreak of hostilities what was known concerning the effects of the pressures of war upon civilian populations and in particular upon those engaged in industrial work? It must be said that those of us who started to work in this field found very little lying ready to our hands. War had been studied. In all truth it might well be said to have been one of the most engrossing preoccupations of man. It had been studied with respect to its strategy; with regard to matters of supply. Its uses as a potential tool had been scanned with infinitely more pains than had been the matter of public health. Considerably more was known about feeding armies than about feeding destitute civilian populations. Upon its economic, geographic and historical aspects most respectable and considerable bodies of information had been accumulated.

When we turned from these to learn what might be known concerning its effects upon social structure, upon neighbourhoods, upon groups of people engaged in work upon families and individuals, there we found a quite striking lack of information. Some studies did exist and I need hardly say that by far the most extensive and most penetrating had been carried out by the Germans (German Psychological Warfare[1]). At the outset, however, let us state what we learned from the few sound publications emanating from the English-speaking countries. An excellent symposium entitled *War in the 20th Century* had been brought out by W. Waller[2] (1940). In it he had endeavoured to outline, from the sociological point of view, the progressive changes shown by the national group as it passes through war. He refers to a period of awareness of the potential hostility of a competing national group. This is followed up by a period of "milling around" when no national policy has appeared and there is considerable friction between groups within the nation. This often coincides with a state of low morale. After war has broken out there is a sharp rise in morale, as unity is achieved. Finally, as war progresses and losses and strains begin to produce their effect, a phase of war weariness sets in and deepens until the termination of hostilities.

Let me emphasize the importance of attempting to obtain from his description, a picture of the flow of events as a nation passes through this tremendous social reaction which we designate as war. At the time it is imperative to keep constantly in mind that these phases are not simple abstractions, but that they awake their repercussions and reverberations in the lives of the vast majority of the individuals passing through them.

As is implied in Waller's outline of the stages of war, during the earlier phases matters of morale are prominent. We are well aware of the extent to which this is true in the commonwealth countries prior to Dunkirk and in the United States before Pearl Harbor. The low level of morale arose from conflicting points of view, from defeatism and from internal friction, all of which were, of course, fostered by our adversaries through their organizations for

* One of the series of lectures on "Human Behaviour and its Relation to Industry", at McGill University, March 15, 1944.

psychological warfare. This general low morale affected the industrial worker, in that there was a high absentee rate; friction between groups within given industries were common, and in certain instances personality breakdowns occurred on this basis.

It was at this time that considerable attention was directed towards morale. Studies of its control were set up and its relations to fatigue, social attitudes, nutrition and general health were investigated. The part played by psychological warfare was recognized and at that time the first rumour clinics began to appear.

Most important, the close relationship between morale and sound mental health was recognized. It was soon seen that as morale began to rise in the civilian population in Britain during and after Dunkirk and during the London *Blitzes* the incidence of mental breakdown was less than expected (Miller, 1940; Pegge, 1940). Individuals who had been able to do very little work for years took up jobs and seemed considerably better. At the same time it was recognized that the presence in a group of an individual suffering from poor mental health, tended to lower the morale of that group and possibly to produce behavioural deviations, at least among some members of that group. This was a discovery of first-rate importance. It has extremely wide applications and seems likely to lead to particularly fruitful results when utilized in industry. Simply stated, it means that where morale is high the mental health of the workers will be good, efficiency will be at a sound level and output will be well maintained. Conversely, in any industrial plant in which there are a considerable number of sick or half-sick individuals, morale will fall, and with it, efficiency and production.

A second lesson of major importance which was learned early in the war was the relation between effort and output. During the period when there was a desperate need to catch up in arms and supplies, the hours of work were greatly lengthened and the tempo of work was speeded up. For a time the output rose greatly and no apparent damage was done to the health of the worker. After a period of a few months, however, it became apparent that unfavourable effects were appearing in all types of workers; management, foremen and machine operators.

EFFECTS OF STRESS

It is of importance to note at this point that the effects of long-continued stress upon executives had been accorded considerable study by the Germans before the outbreak of the war. In searching for the causes of defeat in the first world war, they had been struck with the extent to which failures could be traced back to key individuals who had been under exceptional stress. The case of Ludendorff was especially studied and it was recognized that the necessity of making a multitude of decisions resulted eventually in considerable fatigue; in difficulty in deciding things and in impairment of judgment (Lufft,[5] 1939). It is reported that the Germans set up means of protecting their leaders against the necessity of making decisions concerning matters which could be dealt with by others. This is a matter with which we have not dealt adequately in the industrial field. Much of our discussions have been concerned, very naturally, with the workers. They represent by far the larger group, but the consequences of personality breakdowns in top management can ultimately be much more serious for the concern as a whole. The effects of long-continued stress are, however, best recognized in the worker on the production side. Concerning this, we now have a fairly comprehensive body of information.

The complaints and symptoms shown by those who suffer from a chronic tensional state are numerous, and differ from one individual to another to such an extent that they may seem to be unrelated. If, however, we realize the fact that individuals normally differ in the ways in which they show tension and anxiety, we shall readily grasp the situation. This can be rendered clearer if you ask a group of your friends to tell you what they feel when they have to face an unpleasant situation—going to the dentist; a disagreeable interview with the boss; an altercation with a traffic cop; or speaking in public. Some will tell you that their heart pounds, that they feel short of breath and that their chest feels tight. Others still say that they lose their appetites, that they have gas and that they feel nauseated. Still others will tell you that they feel weak, their hands tremble, their voices become quavering and that they have a tight feeling in the throat. Still others have various combinations of all three types of response (Cameron,[6] 1944).

Now these are precisely the complaints of the over-driven worker. What is the connection? To explain this it is necessary first to grasp what is meant by tension. This is a term which is frequently used but its precise technical significance often is not comprehended.

Perhaps the simplest way to explain it is by use of an analogy. If we compare tension in the human being to steam in the locomotive, we shall get a fair picture of the part which the former plays in daily life. Tension, like steam, is something which is necessary for work (Jacobsen,[8] 1938 and 1940). When we are asleep or resting, tension is usually at its lowest. When we start to work it rises. This is true whether the work is digging or writing. It must also be kept in mind that tension rises whenever it seems likely that we may have to make a special effort; such as when we see someone coming whom we do not want to meet; or before we enter a party where there are a number of strangers.

Now, there is a further similarity between tension and steam and that is that after the day's demands are over, just as the pressure of steam is allowed to drop, so we tend to let our tensional level fall. It may fall quite simply by relaxing at home, reading the newspaper, listening to the radio, or we may relax by making use of one of the available recreations.

However, if the level of tension has been raised very high and has been maintained at that level for a long period of time, we find that it does not readily fall. It tends to be maintained, it prevents us from sleeping well and is still present next morning when we start to work. As may be understood, this tends gradually to accumulate until the worker finds himself under tension almost continually. At this point he begins to complain that he feels on edge, that he cannot relax, that he is restless and that he does not sleep well. If he still continues to be kept under pressure the symptoms show further intensification. He cannot concentrate, and begins to complain of one or other of the patterns which I outlined above. Ultimately his symptoms will prevent his continuing to work and the probabilities are that the industry will be without his services for a long period. These conditions are only now being recognized and it is still, unfortunately, quite possible that instead of the essential psychological causes being understood, he will be treated for his stomach or his heart or whatever form his major complaints take.

METHODS OF PREVENTING TENSION

At the outset I said that we now had a substantial body of information concerning this matter. What facts are there that we could use in a preventive campaign?

Three groups of facts at once present themselves. Those pertaining to the kind of work conditions which tend to produce these tensional breakdowns; second, the facts concerning the kind of person who is prone to such breakdowns and finally those facts which deal with the very earliest evidence of stress shown by such workers. As may be readily understood, the kinds of work conditions which are responsible for the appearance of these tensional states are present in peace-time conditions as well as in plants under wartime pressures. In the latter instance, however, they are considerably more prevalent and more severe.

The first condition is very simply *speed*. As you are aware, we each have a tempo at which we work most economically and comfortably. It is true that there may be some fluctuation from day to day in the speed at which we work, but these are simply swings around an average. It is quite easy for an experienced foreman to recognize the speed at which a worker produces most naturally. This is not necessarily linked up with those rather nebulous terms, willingness and laziness. It is a matter of experience that the man who works more slowly may be the more concerned about his job, may have a greater sense of responsibility concerning turning out a sound piece of work. Now, where the work has to be carried out at a tempo which is consistently above the individual's natural speed of working he has to make an extra effort and this, when prolonged, constitutes one of the sources of tensional breakdown.

The second work condition consists in the necessity for a high degree of accuracy, especially where this is combined with the necessity of keeping up to a fixed level of output. It is a matter of common experience that there are those who tend to turn out considerable amounts of work and there are those who are greatly concerned about the accuracy of the work which is turned out. It is only quite rarely that these two go together since, of course, the one trait tends to interfere with the other. Certain

operations in war industries, however, have demanded both high speed of production and a high degree of accuracy. The worker who is pushed beyond his capacity to do both is constantly faced with censure. At one time he tries for accuracy and loses speed; at another he tries for speed and turns out inaccurate work.

The third work condition which makes for tensional breakdown is increased responsibility. This requires little amplification. With the rapid expansion of industry, men have been given positions of responsibility to which they would not ordinarily have been promoted and which, in many instances, they would not have sought. Further, to the increased burdens which these posts carry there has frequently been added a still greater load of responsibility based upon the knowledge of the importance of these posts to the success of the war effort. This type of condition is, of course, more frequently found in supervisory and managerial groups.

The second large group of facts upon which it is possible to build a preventive campaign consists of the data which we possess concerning the types of persons who are particularly prone to develop tensional breakdowns. Let us say at the outset that such persons are precisely those whom our culture holds up as among the most praiseworthy and desirable. They are those people who are especially conscientious, painstaking and meticulous in their work; they tend to have a strong sense of responsibility; they are particularly reliable. If we criticize them at all, we say that they are perhaps too conscientious for their own good or that they take things too much to heart. Among this group are those people who like to do things in a given way; they like to have a particularly orderly routine and are distressed if the routine is upset. In the general relations of life, apart from these traits which I have mentioned, it will be found that they are apt to be a little lacking in self-confidence unless they feel quite strongly that they are doing the right thing. At work they are inclined to be most particular about details and to spend extra time in getting a piece of work turned out perfectly.

Within this group is to be recognized another special group, namely, those who tend to be rather anxious-minded; who worry unduly about things which most of us take in our stride; who may not be quite as careful to do the right thing as those whom I have just described, but who, when they fail to do so, worry quite excessively about it.

From this you will see that there is a range of personalities running from those who are excessively meticulous and perfectionistic in their work and in their social relations, through those who are considered as particularly reliable and conscientious members of society, to those who while they may not be quite as rigid in their adherence to a conventional pattern of correctness in working and living, nonetheless worry excessively when they deviate from it.

It may be said, as I said at the outset "does not this series of personalities include some kinds of people who are held up as being the more desirable among us?" That is perfectly true, but it is also true that they do not stand up to the long strain of the speed-up or the steady burden of heavy responsibilities as do many other types. A moment's reflection will moreover, reassure us that there are plenty of others who are not so conscientious and meticulous and who do not worry so much when they have to take detours around set standards of accuracy or correctness in living.

Such individuals as I have described can and do play valuable parts in our economy but they should not be placed in positions of stress such as I have outlined. By nature they tend to assume heavier and heavier burdens and to subject themselves to progressively greater stress. If it is necessary to place them in such situations, then they have to be protected by constant supervision.

The third large group of facts to be used in preventing these exceedingly wasteful tensional breakdowns in industry consists in the information which we have concerning the very earliest indications of the development of such states.

Among the first evidences of their onset is the loss of satisfaction in work which the individual experiences. Along with this goes a feeling of lack of energy and zest. Some irritability or mild depression is apt to appear. Then comes the complaint that the man or woman feels tightened up most of the time, he cannot relax, feels tired and "edgey" next morning and begins to have difficulty in concentrating on the job on hand. Difficulty in getting to sleep, anxiety dreams, and the feeling of not being rested properly tend to come on a little later. These constitute the very earliest evidences of the development of a tensional state and if the simplest measures are taken to ensure

that pressure is removed for a time, the further progress of the condition is stopped, tension goes down and the person returns to normal.

Unfortunately, the very fact of the individual's conscientiousness often prevents this being done. He feels that it is his duty to carry on—the job needs him. A prevalent cultural myth reinforces his determination. As you know, it is still rather widely believed by unreflecting people that to suffer from a nervous condition is evidence of a moral weakness or an inadequacy of character. "If you exercise your will power you can snap out of it". Actually, the exercise of the will power is no more likely to terminate such a nervous condition than it is to snap a broken leg back in place.

Though the recognition of the existence of this type of behavioural breakdown was achieved fairly early in the war—the first reports coming from British industrial centres (Miller, 1940)—the fuller picture which I have just given has been filled in only step by step. An adequate preventive and therapeutic program is still lacking, though as I have indicated, certain of the fundamental facts are now available and simply await proper organization and being taken advantage of.

The next group of problems with which we became acquainted centred around the disturbances in living conditions. At the outset of our discussion I said that I would present the matter in the way in which it developed as we worked on it for the last several years. I also said that it might serve to make things more vivid if I referred to the kinds of people who were gradually drawn together to work on these exceedingly intricate and diverse problems.

I think it is reasonable to say that all those groups who before the war had been concerned with various aspects of human behaviour at once started out to see what they could contribute. Prominent among those groups were the social workers, the psychiatrists, the psychologists, educationalists and the very considerable number of social agencies such as the Women's Clubs, the Y.M.C.A., the Y.W.C.A., the Boy's Clubs and the Child Guidance Centres which have developed in such numbers during the last several decades. At first these organizations worked more or less separately. Gradually, however, in most of the larger centres, a growing degree of co-operation was established. This naturally has progressed considerably further in certain areas such as Britain where civilian life was specially disturbed and in the larger industrial areas where rapid expansion of new industries presented particularly acute problems.

The earliest reports were concerned with deviations in the behaviour of the children of industrial workers. I shall not go into extensive detail concerning these since juvenile delinquency during wartime is a matter in itself. It may be said, however, that the absence of the parents from the home, crowded living quarters, under-staffed schools, and the license accorded to destruction have all contributed to this. In many centres this has been met by instituting supervised play in the school playgrounds and setting up nursery schools, by strengthening juvenile courts and other social agencies. Later, wartime living conditions began to produce the second type of behavioural deviation, those consisting in anxiety states, increased interpersonal friction and states of frustration which were attributed to the partial immobilization of considerable groups of people who had depended upon getting around by car or otherwise as a means of relaxation. The importance of this is only now being grasped. There is more to the phrase "getting away from it all" than is commonly realized.

About the same time attention began to be directed to the importance of recreation, particularly for that part of the population which was engaged in high speed production. Several problems emerged. First and simplest was that of ensuring a sufficient amount of recreation. I say "simplest" in this connection only in so far that it was easy to see that the solution was to provide more, but often the practical business of setting up further facilities was anything but easy. This is particularly often the case where the industrial expansion had been established in a rural area. A second problem was that of arranging, in certain districts, that recreational facilities should be available on a twenty-four hour basis, to meet the needs of those working on each of the three shifts.

A third problem which has not yet been properly mastered is that of identifying the proper type of recreation. As I have said elsewhere, there has been an enormous expansion in recreation in the last three or four decades, and many of the recreations conformed to the spirit of the times in that they are competitive and carried out at high speed. Now, in very young persons and in individuals who do not

readily become tense, such recreations are often enjoyed and may indeed afford relaxation. In older workers and in those who have been rendered tense by long, high speed and exacting work, such recreations may be actually harmful. The worker is, nonetheless, drawn to them because of social custom—his friends are there; they expect to meet him; if he does not go he is dropping out of things, and this may be both to his social and material disadvantage. To go, however, is often simply to place himself under much the same conditions which exist during the work hours. This is true of those recreations which are competitive, which call for a high degree of concentration, for fine discrimination and manipulation. Among these are ping-pong, golf, card-playing, tennis, badminton, and to a lesser extent bowling.

There are, however, fortunately a group of recreations which are quite differently organized and which do achieve good relaxation. These are recreations which are non-competitive, which can be carried out at the individual's own natural speed and which call for the use of the large muscle groups rather than for fine, discriminating movements of the hands and eyes. Among these are swimming, skiing, walking, skating, fishing, hunting and horseback riding.

Wartime living conditions have presented problems based upon the increase in wages. I referred in the earlier lecture to the resentment which may be caused in workers who have long been associated with a company when they see new workers brought in and rapidly advanced to wage levels to which they themselves attained only after years of work. This resentment is particularly apt to be acute where the younger individual is a member of the worker's own family. Understandably, difficult situations arise when the son or the daughter brings home wages equal to or exceeding those earned by the father. Relatively early in the war social work agencies in some of the industrial areas in New England began to report that as wages rose there was also a rise in the divorce rate. The explanation, in many instances, appeared to be that the husband and wife, while unhappy in their marriage, had been held together by economic necessity. Once they could afford the divorce, and once it became apparent that the wife could hope to earn a living for herself, the way was open for separation.

The last major wartime problem to which I want to make reference is that of alcoholism. This is clearly not a problem in any way restricted to the war period, but unless steps are taken for its control it inevitably tends to assume much more serious proportions during times of war. Governments recognize this and have for long taken measures to limit the alcohol consumption at such times. The growth of alcoholism during war has several roots. First it is to be related to the general let-down in standards which tend to be established during wartime. Second, it is related to the fact that many workers are displaced from their homes and find few congenial places for recreation. Third, a certain number of those who suffer from tension, who cannot relax, who are sleeping poorly, find that alcohol is a help. This is usually quite temporary however, since it is soon discovered that though there may be relief for a few hours, even quite mild indulgence is likely to be followed, in the case of those tense individuals, by an increase in their discomfort on the following morning.

I have made several references earlier to the presentation of the effects of some of these wartime pressures. What can be done? Some of the measures have already been stated or are self-evident. Such is the case with respect to recreation and to a lesser degree with regard to those difficulties which we described as arising in consequence of increased wages. I should like, however, to state in as concrete form as possible, steps that might be taken to deal with increased tension. It is difficult for anyone who does not see the end results of this, who is not acquainted with the months and even years of unhappiness and incapacity for work, with the many forms some of these tensional states may take, to grasp the tremendous human wastage which they occasion.

The first step to be taken to deal with the matter is the recognition of the types of individuals who are particularly prone to develop such states. Earlier I outlined the personalities of these people in some detail and I feel confident that it is perfectly possible for the personnel worker to recognize such persons through direct questioning at the time of employment. It is to be understood, of course, that, since they are particularly conscientious and meticulous individuals, they are potentially valuable workers. They are valuable, however, in so far as they are properly placed and supervised with reference to the kind of stress to which they are being subjected.

The second step which should be taken is to include in the job analysis enquiry as to the kind of stress which the particular operation imposes upon the individual.

The third step is to see that the members of the personnel department, foremen and counsellors where they are employed, are instructed in the earliest signs of stress and tension. Indeed, at this point it is perhaps not unreasonable to attempt to look a little further into the future and to envisage the possibility of health lectures being given to workers in which the basic facts of human behaviour will be explained. In this connection, I may say that this procedure is being increasingly employed in the armed services. It has been found to be not only of preventive but also of therapeutic value to give instruction concerning such matters, for instance, as fatigue and anxiety to men who have suffered from stress in overseas service and in the merchant marine.

Finally, I want to discuss those measures which have been developed in connection with problems of alcoholism. I used the word "developed" advisedly, since on this continent the measures which are available are as yet quite inadequate. There has been a general failure to grasp the fact that the problem of alcoholism is much more complicated than has hitherto been thought. By the term "alcoholism" I do not by any manner of means mean alcoholic consumption, but consumption to the obvious detriment of the individual's welfare, and more especially consumption which the individual seems powerless to halt. The approaches to this matter come under the following headings: First, the collecting and dissemination of information concerning facilities which exist in a given area; secondly, the development of treatment including the instruction of physicians in those special methods which are available; thirdly, the development of a special means of social control. Among these may be mentioned the provision of hospitals, and, finally, the fostering of research.

These, then, are some of the problems of human behaviour which are appearing during this war. Many of them, no doubt, will become of lesser importance when peace comes. But this is by no means true of all the matters of which we have talked, for in those industrial areas in which the relentless demands of war have exerted their greatest stresses and pressures there has been an immense fostering and forcing of trends which were only impending.

New ways of living, of working together, new human and social values, are being wrought into shape, often, it is true, harshly and with pain but in them we can see, as nowhere else in our society, something of the shape of the future.

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EPIDEMIC JAUNDICE

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FROM midsummer, 1941, to midsummer, 1943, a section of the Foothills Health District was troubled with an epidemic of jaundice which made an interesting study. During the same two winters scattered epidemics were reported at many points throughout Alberta.

This epidemic occurred in two distinct waves during the two winters and had a peculiar geographic distribution. During the first winter 74 cases appeared at Royalties, a town of 1,500, which is situated in the south end of the Turner Valley oil district. A few cases appeared near Millarville, 20 miles to the north, but also in the oil territory, and about 30 cases appeared at Okotoks to the east, which is the main railroad centre that serves the oil district. It is peculiar that during this first winter the town of Longview, about a half mile from Royalties and in very close contact with it, did not develop a case, and the twin villages of Turner Valley and Black Diamond at the road junction joining the three epidemic centres already mentioned, also, were without cases, except for three which were definitely imported from Royalties. These three epidemics appeared to be completely in-

dependent of each other. While only the 74 cases at Royalties were studied carefully, enough is known of the epidemics at Millarville and at Okotoks to convince one that they were clinically identical.

In late September, 1942, five further cases were observed at Mercury, one and a half miles from the major epidemic of the previous winter at Royalties, and almost immediately in early October the first cases of the new epidemic appeared at Black Diamond. This epidemic consisted of 30 cases and was confined strictly to the village of Black Diamond, not spreading to the village of Turner Valley, 2 miles away, nor to the numerous neighbouring hamlets, in spite of very free communication between the places.

The first of these epidemics consisted of 74 cases of jaundice in 33 families and 19 other cases at the same time in the same 33 families with identical symptoms, but in which no jaundice was observed. There were also a number of other cases of "stomach flu" in the same neighbourhood as these cases which had similar symptoms but which have not been included as part of the epidemic. One other case of jaundice was ruled out because it was definitely of the obstructive type.

The second epidemic occurred at Black Diamond during the second winter, was similar in type and also had a group of cases of "stomach flu" mingled with it. No close check was kept of these associated cases in this second epidemic.

About 5% of the exposed population became involved in these two epidemics and also at Okotoks where the epidemic was observed more casually.

Royalties is a typical "boom town" of about 1,500 people with poor housing conditions while Black Diamond is somewhat better, but still very definitely an "oil town". In both communities the people are comparatively well-to-do. The general sanitary condition at the time of the epidemics was fairly satisfactory. Both towns use earth pit privies which are rarely fly-proof, though that hardly seems important in a winter epidemic. The water supply at Black Diamond was from private wells, while at Royalties water was from two sources, a chlorinated river water and "spring" water which was peddled from door to door by a "waterman". All of these water supplies were consistently negative for *B. coli*.

The school rooms in both communities were crowded and the contact between the children outside of school was very close. In addition the houses were small and the contact within the home was very close.

SIGNS AND SYMPTOMS

Of the 74 cases with jaundice observed at Royalties only 35 cases were seen by the family doctor. Many of the others were observed by one of us in his capacity as District Health Officer, and all of them were observed by the other author in her capacity as Public Health nurse. The symptoms observed were remarkably uniform but varied very considerably in severity. A number of cases had only fleeting symptoms and transient jaundice which did not interfere with the daily routine, while one young woman was incapacitated with a very severe illness lasting 6 or 8 weeks.

The average case commenced suddenly with fever, loss of appetite, nausea and vomiting, abdominal pain and quite often with chills. A few cases were hospitalized on account of a "surgical abdomen" but none were operated on. The leucocyte count was low in these hospital cases, which was the main reason that no operations were done. The jaundice did not show up until the fourth day or later, while the acute symptoms lasted usually about ten days. In the very mild cases some patients claimed that jaundice was the only sign of illness, but most patients were in bed for several days. Usually the general symptoms were improving by the time the jaundice appeared.

The following symptoms were noted among the 74 cases with jaundice observed at Royalties.

TABLE I.

	Percentage		*Percentage*
Jaundice	100	Abdominal pain	88
Anorexia	100	Fever	82
Nausea	96	Headache	68
Dark urine	93	Chills	50
Vomiting	92	Aches and pains	44
Light stools	90	Backache	43
Loss of weight	90	Itchiness	37

The infective nature of the ailment is strongly suggested by the acute onset, chills, fever, and by aches and pains. The abdominal pain was usually described as being "in the middle", though the upper abdomen and upper right quadrant were specifically mentioned by 38% of the patients. Tenderness under the edge of the ribs on the right side could usually be ob-

served, and by the time the jaundice had developed the liver edge could usually be felt an inch or so below the costal margin.

The fever varied so much in different cases that it was of little value in diagnosis. The more severe cases ran a temperature in the vicinity of 103 and 104°.

Itchiness was noted in 37% of the cases, but was rarely a cause for complaint.

Incubation period.—In a few cases it was possible to spot quite definitely the incubation period and this was confirmed by inference in a number of other cases. In those where the evidence could be relied on 69% gave an incubation period of from 20 to 35 days, but shorter and longer periods were mentioned. Two cases seemed to have an incubation period of eight weeks, though one suspects that some unknown exposure may have occurred in the interval. Also, it is probable that the single case which showed an interval of one week must actually have been infected at some previous time.

This long incubation period suggests that the disease is caused by a virus, and further evidence to this effect is provided by Findlay and McCallum (*Trans. of Roy. Soc. Trop. Med. & Hyg.*, 1937 and 1938). They describe an accident where a yellow fever virus, used for inoculations became contaminated and caused jaundice similar in type to this epidemic. This contamination was carried through several culture generations, continuing to cause jaundice until a new yellow fever culture was obtained when the jaundice ceased. Only a virus contamination could have been carried in this way, which pretty well proves the type of organism causing the jaundice.

Period of Infectivity

Authorities who have studied the period of infection find that it is probably less than ten days from the onset of illness. We were not able to collect any information on this question. It is certainly most infectious in the few days of illness prior to the onset of jaundice.

Seasonal Distribution

Epidemic jaundice is very definitely a winter disease. One case was observed at the end of July and then in the same family two other cases were observed 5 or 6 weeks later in early September. The cases with jaundice were distributed as follows:

Table II.

July	1	February	16
August	0	March	12
September	5	April	11
October	1	May	7
November	11	June	0
December	21		
January	24		109

There were no cases during the summer of 1943.

Age and Sex

Details as to age and sex were only obtained in 113 cases, including the cases of "stomach flu" at Royalties that were in the same family and at the same time as cases of jaundice. There is no apparent distinction between the sexes except a tendency for the male cases to average a little younger than the female. The oldest patient was 46 and the youngest was nine months (Table III).

Table III.

Age	*Male*	*Female*	*Total*
0-4	5	1	6
5-9	22	13	35
10-14	19	19	38
15-19	1	7	8
20-24	2	6	8
25-29	1	2	3
30-34	4	2	6
35-39	3	1	4
40-	1	4	5
Total	58	55	113

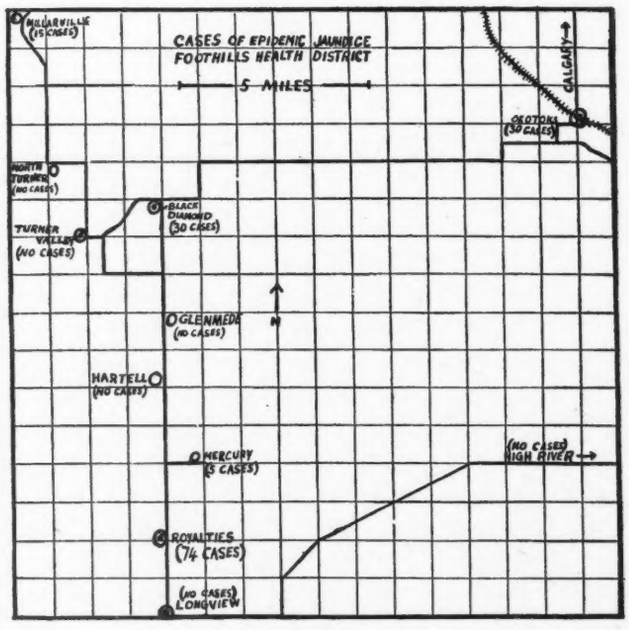

Chart 1

Milk and water supplies.—The families involved obtained their milk from all the authorized sources in the community, from two unauthorized sources, from three private cows, while some used canned milk.

Thirty-eight different water supplies were used by the 56 families in the series. This is almost every available source in the area and involved springs, chlorinated river water, and a variety of deep drilled wells.

Contact.—No quarantine was attempted, so there were numerous possibilities of contact both in the home and at school as well as at work and play. The community is small so that contact with more than one possible source of infection was commonly reported. Not only did direct contact seem to be the method of spread but close contact seemed to be necessary. The family exposures in the Royalties epidemic are interesting (Table IV).

TABLE IV.

DISEASE IN FAMILIES (ROYALTIES EPIDEMIC ONLY)

Cases per family	*Families*	*Total cases*	*Family exposures no disease*
1	9	9	20
2	6	12	12
3	11	33	36
4	2	8	5
5	4	20	9
Total	32	82	82

This Table shows that in the 32 families involved there were 164 individuals of all ages and that 82, or 50%, actually became infected. At Millarville one family of 11 members all became infected, although only the father, mother and one child showed jaundice. Nine families with 29 individual members had only one case each. This information and the seasonal incidence very strongly suggests that the virus is spread from person to person by droplet infection and that control efforts should be attempted by personal hygiene. A ten-day isolation for the case would also appear to be in order.

Pathology.—We have no way of knowing the pathological picture to be found in these cases, but apparently it has become accepted that it is not a catarrhal jaundice, because the bile ducts are not inflamed or obstructed. Others have reported an infective hepatitis in these cases, and some authors prefer that name. The inflammatory reaction is observed at the periphery of the liver lobules, showing a varied degree of reaction in different cases and even in the same case all varieties from simple cloudy swelling to complete necrosis.

Our thanks are due to Miss Betty Folinsbee, P.H.N., for her work in collecting the information relating to the second epidemic.

Dept. Public Health,
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RÉSUMÉ

Durant les hivers de 1941 et 42 des épidémies d'ictère sont survenues dans quelques villages de l'Alberta. Les signes cliniques principaux, d'intensité variable, étaient les suivants: début subit par fièvre, inappétence, nausées et vomissements, douleurs abdominales, leucocytose à peu près normale et appartion d'ictère vers le 4ième jour. Les autres signes aigus durèrent environ 10 jours.

L'incubation varie de 20 à 35 jours. On croit à l'action d'un virus. La période d'infectivité parait être de moins de 10 jours. Il s'agit d'une maladie de l'hiver—de novembre à avril. Les âges les plus frappés sont compris entre 5 et 14 ans; les deux sexes sont également atteints. La provenance du lait et de l'eau a été trop variable pour conclure à une étiologie de cette nature. Les contacts ont été nombreux. La maladie se propage apparemment par contact direct. JEAN SAUCIER

THE PROBLEM OF NASAL MEDICATION WITH PARTICULAR REFERENCE TO PRIVINE HCl 0.1%

By Joseph Gollom, M.D.

Toronto

NASAL medication as a means of alleviating nasal symptoms has become increasingly prevalent during recent years. A high percentage of such drugs are counter-prescribed. The public has become educated to the use of nose drops. During one week ending February 24, 1942, the American Institute of Public Opinion estimated that a total of 23,000,000 persons suffering from the common cold spent approximately $11,500,000 on medication.

The whole attitude towards therapy of nasal disease has undergone drastic changes during the past 15 years. The character of drugs used in the nose has altered. Surgery and its indications have become more conservative. It is no longer common to see patients whose intranasal structures have been grossly mutilated or removed with resultant symptoms worse than those that originally prompted the patient to seek relief. The basis for this change can be found in the ever-increasing knowledge of the physiology of the nose and the histopathology of nasal and sinus mucous membranes.

Among other functions the nose filters, moistens, and warms the inspired air. Approximately 500 cu. ft. of air enter the nose every 24 hours. Taking part in these physiological protective activities are an overlying film of mucus covering a layer of actively functioning cilia, which in turn projects from a highly labile mucous membrane. The film of secretion covering the mucous membrane exists as one continuous structure and is moved in the direction of the nasopharynx from the front of the nose at the rate of 4 to 6 mm. per minute. The motion is kept up by direct ciliary action, by traction, by force of gravity, and by the action of swallowing. The nose has a new film of mucus about every 10 minutes in the posterior two-thirds, which would explain why cultures from this region are so frequently sterile. It should also make us pause before deciding that antiseptics should form a necessary part of any nasal medication. Admirably adapted to the function of entrapping dust, bacteria, powder, etc., the mucus is thin, elastic, slippery, and tenacious.

The lining membrane of the nose is continuously in the process of adaptation to changes resulting from acute infections, weather conditions, smoke, dust, and chemical substances. It consists essentially of a pseudo-stratified ciliated columnar epithelium, a basement membrane and a loose fibro-elastic network of connective tissue containing glands and small blood vessels. In thickness it varies from about 0.5 mm. to several or more millimetres. Goblet cells are common. Cilia are numerous throughout the sinus membrane and nasal passages, except near the nasal vestibule and in the olfactory sulcus. The goblet cells and glands secrete the mucous coat which, together with the cilia, functions like a conveyor-belt.

Just beneath the epithelium lies the tunica propria, a loose fibro-elastic connective tissue network. It contains cells of all kinds, particularly lymphocytes, numerous glands and a rich supply of blood vessels. The arteries form a capillary network just beneath the epithelium and around the glands. It is this arterial network which is acted upon whenever a vasoconstrictor drug is applied to the mucous membrane. The superficial veins lead to deeper venous plexuses. The latter are well developed along the inferior turbinates, the dependent border of the middle turbinate, and along adjacent borders of the nasal septum. They form the cavernous sinuses which give to these areas the character of erectile tissue.

In acute and chronic inflammation of the nasal mucosa there occurs a proliferation of powerful inflammatory cells in the tunica propria, mainly polymorphonuclear leucocytes, lymphocytes, histiocytes, and fibroblasts. Most of these cells have phagocytic properties of great importance in engulfing pathogenic organisms.

Fabricant[1] has done extensive research on the subject of pH of the nasal secretions. It is normally a little on the acid side, varying between 5.5 and 6.5. In 1934 Tweedie found that the pH values affected the bacterial flora of the nose. When the pH was 6.5 or below, the cultures were usually negative. With an elevation of the pH to the alkaline side bacteria were usually found.

The nasal pH changes very rapidly. Cold or chilling produces a drift towards alkalinity, heat towards acidity. The pH of nasal secretions during an attack of acute rhinitis or allergic rhinitis is alkaline. Prolonged rest and sleep, two well-known therapeutic measures for the treatment of acute rhinosinusitis, produce an acid trend in the nasal pH. On the basis of the above findings, Fabricant recommends in the selection of a local drug one whose pH is slightly acid. Drugs which are highly alkaline, such as certain sodium-sulfathiazol solutions, or highly acid, epinephrine for instance, are quite irritating to the nasal mucous membrane.

Turnbull,[2] in a recent article challenges some of Fabricant's conclusions, and justifies the introduction of a new ephedrine-sulfathiazole solution with a pH of 8.6 to 9. He maintains that this solution does not interfere with ciliary action.

In 1934 Lierle and Moore[3] studied the effect of drugs commonly used in the nose on the ciliary action of the nasal mucous membrane. Tap water and distilled water, 10 and 20% cocaine, 1% thymol and 1% eucalyptol, 1:1,000 epinephrine and 2% zinc sulphate are definitely detrimental to the ciliary beat. One-half per cent of silver nitrate is fatal to ciliary action. Mineral oil does not mix with nasal mucus and hence does not penetrate to the mucous membrane proper. It lies inert on the mucous layer and is propelled with great difficulty by the cilia.

Fabricant and Van Alyea[4] in 1942 recommended "a new and effective non-toxic nasal vasoconstrictor, called 'privine-HCl' 0.1%. It is isotonic and has a pH of 6.2. Animal experi-

ments reveal that it acts favourably on ciliary activity; pH studies on patients demonstrated that in individuals who had a slightly alkaline pH, privine HCl 0.1% reduced the pH to a slightly acid level approximating the normal pH of the nose. Clinical study of 104 human subjects with various forms of nasal involvement showed that this drug can be applied satisfactorily in all of the accepted methods of application.'' In a more detailed review published in January, 1943, Fabricant and Van Alyea[5] again described this drug and found it to fulfil the criteria necessary for good nasal therapy. In addition, its decongestive action appeared to last longer.

During the year 1943 it was my experience to see more than 30 patients who became more or less addicted to the use of privine for the relief of nasal obstruction. Further, it is my impression that the obstruction was prolonged by the use of privine, and that relief was obtained only by discontinuing this drug.

After seeing a few such cases it becomes fairly easy to make the diagnosis by means of a careful history before a rhinological examination is done. Here is a typical story. A patient develops a head-cold. After a few days, with the nose a little stuffed, the patient seeks relief from doctor or pharmacist. Privine gives quick relief, as it apparently is a rapidly-acting vasoconstrictor. At first two or three applications in 24 hours are sufficient. However, the ultimate relief of permanent decongestion becomes more elusive and the patient begins to use the drug oftener. I have seen patients who felt compelled to use privine HCl every two or three hours, day and night. When the patient attempts to discontinue the drug, he complains of a feeling of suffocation. The nose blocks up tightly and the throat feels constricted.

It is a common story for the patient to start with a half oz. bottle, and, weeks later, when his nasal condition should have been a thing of the past, he is found to have graduated to 4 oz. bottles, as the net cost per c.c. is less.

The appearance of the nasal mucosa is typical. When the privine effect wears off, the turbinates are found to be swollen, possess a somewhat doughy feel, and appear a little more pale than normal. The patient may have some discharge, but complains mainly of blockage. He feels grateful to privine for whatever momentary relief he gets.

The treatment is simply to discontinue the use of privine. This is very difficult at times, as the patient is fearful of the nasal obstruction that ensues, especially at night. Nembutal, gr. 1.5 or gr. 3 for the first couple of nights is helpful. By the third day the chronic congestion has begun to subside. It takes 3 to 10 days for complete clinical relief.

CASE 1

Miss B.R., white, adult. Seen first on June 5, 1943. She had contracted a head-cold one year previously. She began using ''Vick's nose drops'' but in a few days switched to privine. At first she used the drops every four hours. When seen a year later, she was using them every three hours and at least once every night. Both nasal passages were blocked. She had a drumming in the head. The septal and turbinal mucosa was pale and swollen. She was advised to discontinue all nose drops and was given nembutal, gr. 1 ss hs. for several nights. She was seen 4 days later when she stated that during the first 24 hours her nose was completely blocked, then either passage would open for a short period, but the nights were still bad. She was seen again on June 16, when she said she was breathing normally again. The nasal congestion was gone.

CASE 2

Mrs. M.C., white, adult, was seen on June 9, 1943. Head-cold 6 weeks previously. Resorted to privine for relief of congestion, but the blockage did not let up. Without privine for 3 days her difficulty cleared up. (This type of case was common.)

CASE 3

Mr. M.B., white, adult, was seen on March 6, 1943. He had had nasal obstruction since an attack of hay-fever in August, 1942. He resorted to privine every 2 to 4 hours day and night for relief of obstruction. Skin testing showed ++ reaction to dust and ragweed. He was immediately started on dust vaccine along with ragweed. The nose continued blocked; the turbinates were boggy. After several weeks he was advised to discontinue privine, and in a few days his nasal obstruction cleared up.

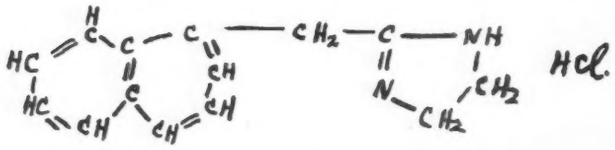
Interestingly enough, this patient resorted to privine again in September, 1943, at the height of the hay-fever season, without my knowledge. On November 27, he complained to me about his nasal obstruction. After 3 days without privine his obstruction subsided and he breathed freely again.

CASE 4

Mr. N.D., white, adult, was seen first on April 3, 1943. This patient had nasal obstruction following a cold during the winter, and privine was prescribed for relief. Later he complained of epiphora. Another rhinologist had performed 3 sinus irrigations with little relief. The patient was sneezing a little daily. The turbinates and septal mucosa seemed very boggy. He was advised to discontinue privine, and, meanwhile, was given ephedrine and nembutal by mouth, then a couple of Proetz displacement treatments, and finally a tamponage with argyrol. The nasal blockage remained. He would not discontinue privine for fear of choking up. Finally, I hospitalized him for 3 days, placed continuous steam inhalations in his room and gave him nembutal gr. 3 the first night, but no privine. The congestion subsided in a few days. After approximately a week without privine, he was able to breathe as freely as he had before the onset of his cold several months previously.

COMMENT

This experience with privine HCl 0.1% is a reminder of an old problem associated with the use of most vasoconstrictors. Chemically, privine[5] is a 2-naphthyl-methyl imidazoline and its chemical formula is related to that of epinephrine, being



Epinephrine was early found to be an excellent peripheral vasoconstrictor, but repeated usage in the nose was soon abandoned. Its immediate side-effects are irritation, sneezing, lacrimation and stinging. Its secondary reactions are returgescence, atony and bogginess.

Scarano[6] made a comparative study with ephedrine 1%, benzedrine 1% and benzedrine inhaler from the standpoint of vasoconstriction plus any side reactions. He found that with ephedrine the irritative symptoms and congestive reactions were greatest and with benzedrine inhaler the least. Dintenfass[7] warns against the free use of nose drops, mentioning vasoconstrictors like ephedrine, because of the reactionary congestion which occurs.

Immediate side-effects with privine are as a rule uncommon. Its shrinkage action is immediate and adequate. The secondary reaction which develops after a few hours and eventually becomes chronic is thought by the patient to occur in spite of privine, not because of it. Hence its continued use by certain individuals over long periods of time.

CONCLUSION

Privine HCl 0.1% can be a potentially harmful drug when used without supervision or for prolonged periods. A few days is the longest it should be used at any one time. As an aid in avoiding its harmful effects, its sale should be limited to prescription only.

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VERTIGO*

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VERTIGO, or dizziness, is a sensation of turning, either of the surroundings or of oneself, with, perhaps, staggering, falling, nausea, vomiting, tinnitus and disturbed hearing.

In his essay, *Æquanimitas,* Osler advises the physician to cultivate equanimity in order to avoid mental turmoil in times of stress; equilibrium implies absence of vertigo and is to the body what equanimity is to the mind.

The mechanism of vertigo is understood by studying its anatomy, physiology, neurology and pathology; the reader should have before him photos showing the anatomy of the inner ear. There are two kinds of sensory impulses concerned in the maintenance of our equilibrium: (*a*) exteroceptive, which arise from external stimulation of sense-organs in the skin and superficial tissues, and travel up the cord to the medulla, the greater part going to the sensory cortex, but some passing to the cerebellum; (*b*) proprioceptive, which arise from within the body, *i.e.,* from the vestibule and from muscles and peri-articular tissues. The vestibular nerve begins in the sensory receptors of the vestibule and semicircular canals and ends in its complex nucleus; fibres proceed from the nucleus as follows: (*a*) to the cerebellum by the inferior peduncle; (*b*) to the oculomotor nuclei, explaining vestibular nystagmus and how the gaze can remain fixed on an opponent or object during movement; (*c*) to the vagus nucleus, thus explaining associated nausea and vomiting; (d) to the nucleus of the spinal accessory nerve for co-ordination of head-movements; (*e*) to the anterior horn cells by the vestibulo-spinal tract, which is probably for reflexes of equilibrium.

The pathway of the proprioceptive impulses from muscles and joints is via posterior roots, spino-cerebellar tracts, medulla and inferior peduncle to cerebellum. The cerebellum also receives fibres from the cerebrum by the middle peduncle. It in turn sends fibres to the cerebrum by the superior peduncle, with intermediate stops at the red nucleus and thalamus. The red nucleus sends fibres to the anterior horn cells through the rubro-spinal tract. Thus the

* Read before the Essex County Medical Society, Windsor, Ont., October 5, 1943.

cerebellar reflex arc consists of: (*a*) afferent pathway: spino-cerebellar tracts, medulla and inferior peduncle to cerebellum; (*b*) efferent pathway: cerebellum, superior peduncle, red nucleus, and rubro-spinal tract to anterior horn cells.

The cerebellum is a clearing house for the impulses it receives from the proprioceptive end-organs and from the cerebrum. It elaborates complex reflexes of equilibrium and locomotion which it places at the disposal of the higher centres which initiate and execute movements.

The petrous bones converge at about a right angle. Removal of the roof of the middle ear shows anteriorly the opening into the Eustachian tube and, posteriorly, the aditus leading to the mastoid antrum. Medially, buried in cancellous bone, is the labyrinth arranged from before backwards as cochlea, vestibule and semicircular canals. The bony labyrinth has an endosteum holding perilymph. In this fluid floats the membranous labyrinth, which is filled with endolymph and contains the following sensory receptors: (*a*) the organ of Corti in the cochlea; (*b*) the crista in the ampullary end of each of the three semicircular canals; (*c*) the macula of the utricle and of the saccule.

These end-organs are ridges of neuro-epithelium with hair-cells attached to an overlying membrane which is called the cupula in the case of a crista; it is called the otolith membrane in the case of a macula, from the content of tiny calcareous bodies, the otoliths. The stimulus for a crista is a movement of the endolymph which shifts the cupula, causing a pull on the hair-cells. This gives information of rotational movements of the head. The stimulus for a macula is a displacement of an otolith membrane by gravity and again a pull on the hair-cells. This gives information of movements in a linear direction.

The labyrinth of each side sends a steady stream of impulses to the higher centres.[7] So long as the activity of both is equal there is equilibrium of the body, but if one side becomes overactive, as from irritation, dizziness results. If one side has been destroyed by infection of or massive hæmorrhage into the labyrinth there is an overpowering vertigo for some weeks. This gradually ceases as compensation takes place and the surviving labyrinth takes over the work of both.

Bárány's device for remembering the positions of the semi-circular canals is: the forearms are held forward so as to form a right angle. The left forearm held midway between pronation and supination permits the flexed left hand to rest perpendicularly on the extended right hand, palm up. This represents the canals on the right for the normal upright position of the head. To represent the canals on the left, the right hand is similarly placed on the palm of the left hand.

I have devised a method of my own. One simply remembers that the superior semicircular canal is placed astride the long axis of the petrous pyramid, perpendicularly and at right angles to it. From this the respective positions of the other two canals are visualized, because the three canals, superior, posterior, and lateral, are all at right angles to one another. Moreover, by visualizing the relation of the petrous bones to the floor of the skull, one can deduce the new respective positions of all six canals, if need be, in a given movement of the head.

As a Symptom

Vertigo is a symptom of many disorders, such, for instance, as, (*a*) chemical, *e.g.*, industrial poisoning, poisoning by alcohol, tobacco and drugs like the sulfonamides, salicylates and cocain. (*b*) Infective or inflammatory conditions, *e.g.*, middle ear infections with labyrinthine and brain complications. Focal infections as from teeth and tonsils. (*c*) Metabolic dysfunction, e.g., diabetes, gout, Addison's disease and hypo-ovarianism (menopausal disturbances). (*d*) Defective function, *e.g.*, neurasthenic vertigo and travel sickness.

It is doubtful whether vertigo occurs without some organic basis. A few attacks of dizziness in awkward circumstances, however, may so demoralize a patient as to lay the basis of a psycho-neurosis. Many people suffer from travel sickness. They suffer from nausea, vomiting, sense of fear, and sometimes, dizziness if they travel on a car, train, ship or plane.

Following Ménière's classical report in 1861, a definite group of symptoms has been called Ménière's syndrome. Without warning or apparent cause, a patient suddenly becomes very dizzy and ataxic. Objects seem to move about, and there is usually nausea and vomiting. Unilateral decreased hearing with tinnitus is present during the attack. The etiology is obscure. The peri-lymph drains directly into the spinal

fluid through the aqueduct of the cochlea; the endolymph drains through the wall of the saccus endolymphaticus; interference with this drainage causes increased pressure within and dilatation of the membranous labyrinth of the affected side. This condition has been found post-mortem in patients with Ménière's syndrome dying of other causes or after an operation for its relief. Some authorities call it a glaucoma of the labyrinth.

A plug of wax in the external canal causes immediate dizziness if for any reason it is driven against the drum which carries the ossicles with it. The stapes is pressed into the oval window, raising the intra-labyrinthine pressure on that side. As already explained, the unequal activity of the two labyrinths causes the dizziness. The same explanation applies to the vertigo of Eustachian tube obstruction, excepting that the atmospheric pressure gradually causes the drum to be retracted, if the absorbed air in the middle ear is not renewed.

Vertigo may also occur in low blood pressure states, probably due to anæmia of the labyrinth. The dizziness associated with high blood pressure is assumed to be due to congestion of the labyrinth. However, some authors believe that the anxiety state often present with hypertension is a factor in causing the dizziness. Altered blood states causing faulty nutrition of the labyrinth may explain the dizziness of anæmia. Post-traumatic headache with dizziness is common after head injuries. Errors of refraction are to be suspected in patients who are made sick by travelling on a train or car. Covering the unaffected eye of a patient with paralytic squint causes immediate dizziness because of the false projection in the squinting eye. Finally, it is thought that allergic œdema of the labyrinth produces vertigo.

The vertigo occurring with brain tumours will be considered later.

A patient may complain of dizziness when what he really means is a feeling of faintness which passes quickly. The direction of falling during a severe bout of dizziness is important. In true labyrinthine vertigo the fall is always away from the more active labyrinth. Thus when a labyrinth is made more active by irritation, the fall is away from that side. On the other hand if a labyrinth is depressed or destroyed by infection, the fall is to that side. In any case of vertigo one should inquire about habits respecting alcohol, tobacco and drugs; it is well also to ask as to occupation and exposure to industrial poisonings, about accidents such as head injuries, and infections such as syphilis. When the history seems obscure a functional inquiry by systems may help.

Vertigo when not associated with aural suppuration may be distressing, but when it is associated with aural suppuration there may be danger to life at any time. The infection may extend from the cavity of the middle ear as follows: (*a*) through the roof toward the cerebrum causing localized meningitis, extra-dural or sub-dural abscess or brain abscess; (*b*) medially towards the labyrinth through the oval or round windows or through a localized wall necrosis; (*c*) posteriorly through the aditus to the antrum and mastoid cells. Further extension may cause perisinus abscess, jugular thrombosis and involvement of the cerebellum or its membranes in a manner similar to the invasion of the temporal lobe. The tendency that some have to neglect a chronic running ear is therefore unfortunate.

Cerebrospinal meningitis may invade and destroy the labyrinth, the pathway being the internal auditory meatus. The resulting prostrating vertigo, lasting some weeks and concluding with compensation by the other labyrinth has already been described.

In the examination of a case of vertigo abnormalities of the pupils suggest a basal meningitis with involvement of such cranial nerves as the optic, oculo-motor, trochlear, abducens and often others. Nystagmus may be present and may be ocular or vestibular. The ocular type has equal oscillations; it is seen in cases with high refractive errors and also when there is a low visual acuity from any cause. Vestibular nystagmus, on the other hand, has a quick and a slow component. The slow movement away from the normal position of the eyes is a measure of the labyrinth's response to a stimulus. The quick return represents the effort of the higher centres to return the eyes to their normal position. The direction of the nystagmus is stated in terms of the quick component. At the height of vestibular nystagmus there is nearly always some vertigo and ataxia. When the oscillations have weakened, the symptoms may be reinduced by sudden movements of the head. About 20% of normal people show a fleeting nystagmus without symptoms, on turning the eyes to the extreme right or left; this must not be confused with a genuine nystagmus.

Refraction is a necessary part of examination and should include examination of the extra-ocular muscles and the eye grounds. Whenever possible and advisable, I dilate the pupil regardless of age, and I use retinoscopy. There is a hyperæmia of the disc if it is merely redder than normal. This may advance to optic neuritis, which in many cases passes into optic atrophy very gradually. A moderate swelling of the disc, of, say, 2 to 4 diopters, which shades off into the surrounding retina with hæmorrhages and exudates, is a neuro-retinitis or papillitis, and occurs in advanced renal disease; 3 dioptres represents 1 mm. of elevation of the disc. If the swelling is limited to the disc, and there are tortuous vessels disappearing over the edge, to reappear out of focus on the retina, perhaps with some hæmorrhages, it may be considered a papillœdema or choked disc, if there is an elevation of 5, 6 dioptres or more; this is due to increased intracranial pressure and suggests an expanding intracranial lesion.

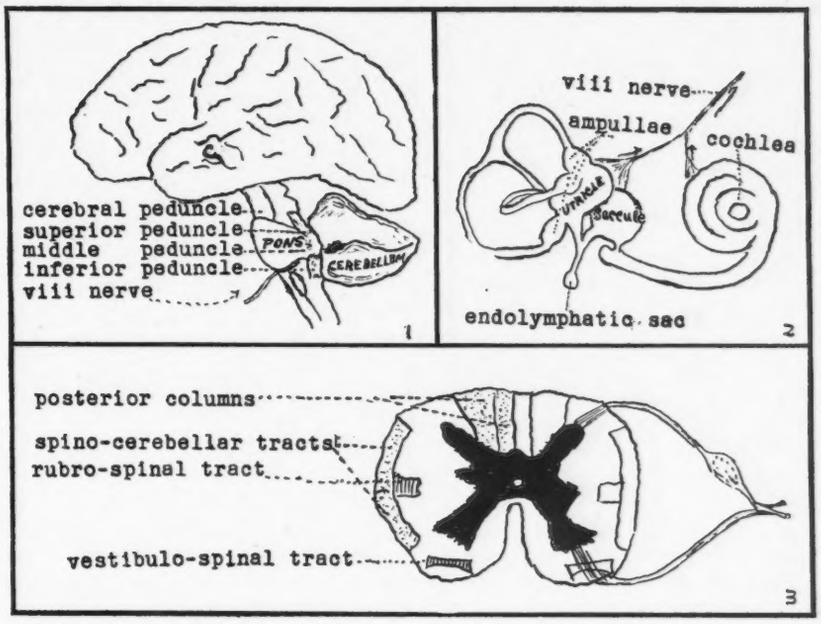

Fig. 1.—Left lateral view of brain. **Fig. 2.**—Membranous labyrinth. **Fig. 3.**—Cross section of spinal cord.

In any case of vertigo the finding of a retracted ear drum associated with tubal catarrh is important. This condition often causes aero-otitis in air pilots. The hearing should be tested. If the conversational voice is heard separately in each ear at 20 feet, there is average normal hearing. Reduced hearing with this simple test may call for further tests with tuning forks or even the audiometer. Sound reaches the cochlea through the middle ear and also through the cranial bones. One applies a vibrating 512 d.v.s. fork to the mastoid process and asks the patient to indicate the cessation of the sound. The interval in seconds is the duration of bone conduction. Similarly the fork is brought to the meatus, a finger closing the opposite meatus; the interval in seconds this time being the duration of air conduction. In disease of the middle ear, air conduction is reduced, and conductive deafness is present; in diseases of the labyrinth or auditory nerve, bone conduction is reduced, in advanced cases, almost to the vanishing point, and perceptive or nerve deafness is present. A patient with conductive deafness may not hear direct conversation very well, but will have no difficulty on the telephone provided the internal ear is healthy. Difficulty in hearing on the telephone suggests nerve deafness.

In the examination of cases of vertigo, tests of pointing and past-pointing are all important; they may be described in brief. The patient closes his eyes, and with his first finger touches the finger of the examiner, who sits facing him. He then raises his arm above his head, and in bringing it back tries to touch the examiner's finger again; if successful he points correctly. If the pointing test is repeated after one labyrinth has been irritated, as by the cold caloric test, he will point incorrectly, that is, to one side or the other, of the examiner's finger; *i.e.*, past-pointing. The mechanism in falling, in an attack of vertigo, is really a past-pointing of the whole body. Falling is less apt to occur if the vertigo is in the horizontal plane, because we are accustomed to turn in that plane, as in dancing; the tendency in vertigo in the frontal plane is to fall to one side or the other, and in the sagittal plane, to pitch forward or backward.

The so-called caloric tests play also an important part in examining a case of vertigo. The cold caloric test may produce symptoms similar to an attack of the Ménière's syndrome. It is replacing the rotation chair test because it is more convenient; it is less disturbing to the patient, and, as a further advantage, stimulates one labyrinth at a time.

The test calls for an emesis basin, a 10 c.c. syringe with a 1½ inch rubber tip of small lumen, disconnected and lying in water containing pieces of ice. The patient lies down with the ear to be tested facing the ceiling. This brings the lateral (horizontal) canal into the vertical plane; this is because the test depends on the development of a convection current in the endolymph of the canal, most stimulated by the use of the ice water in the external auditory meatus. The flow of the endolymph, whether it be toward or away from the ampullary end of the semi-circular canal in question, displaces the cupula, causing a pull on the hair cells of the crista. The subjective sensation of the vertigo is always opposite to that of the endolymph movement.

The patient looks away from the ear being tested; the syringe is assembled and loaded, and, 3 c.c. of ice water are slowly instilled into the external meatus. The instant that nystagmus is noted the ear is emptied of water, and the patient sits up with his head in the normal upright position. This brings the lateral canal back to its normal, *i.e.*, the horizontal plane. The endolymph of that canal is, of course, still in motion and objects in the room appear to whirl about in the horizontal plane; there will be past-pointing, tendency to fall, nausea and vomiting, depending upon the degree of reaction. The time of onset, quality and duration of the nystagmus is noted. If after several minutes no reaction is noted, the labyrinth under test is probably dead; absence of reaction suggests advanced nerve deafness or destruction of the labyrinth by infection or new growth.

As stated above, vertigo may be a symptom of brain tumour. In patients with vertigo and unexplained nerve deafness, syphilis as a cause having been excluded, tumour of the eighth nerve, acoustic neuroma, remains to be considered.[5] The unfolding of the symptom complex may take a long time. Late in the progress of these neuromata, it might be quite impossible to say whether a tumour of the cerebello-pontine angle has arisen from the eighth nerve or from some other structure such as the cerebellum; careful records of the first symptoms are important. It is self-evident that an acoustic neuroma will first give rise to symptoms referable to the nerve itself. It is not surprising therefore that in Cushing's case-histories of this variety of brain tumour, the first complaint was, repeatedly, difficulty in the use of the telephone. If on the other hand the early symptoms are cerebellar, *i.e.*, nystagmus, ataxia, and adiodokokinesis, origin in the cerebellum is at least a possibility. Deafness may appear late in this latter type of case as the tumour grows large enough to encroach upon the auditory nerve. Of interest is the fact that acoustic neuromata constitute about 6% of all intra-cranial tumours and about 24% of subtentorial new growths. Of late appearance in a case of vertigo associated with tumours in the cerebello-pontine angle will be symptoms due to stretching and distortion of the cranial nerves and the structures in the area; there may be facial pain and numbness, diplopia, facial paresis, and even disturbances of speech and swallowing. Headache, often severe, vomiting, and failing vision may be present, as may also choked disc with perhaps early optic atrophy.

To conclude the examination of a case of vertigo, nasal and post-nasal inspection is done, because the post-nasal drip of sinus suppuration may infect the Eustachian tubes. Hallpike and Cairns recently described two cases of Ménière's syndrome who had died after an operation for its relief. The autopsy showed a general dilatation of the entire endolymph system of the affected side in both instances; the explanation of this finding is not completely satisfying, but according to one observer (Wright), the condition is a focal labyrinthitis from sepsis elsewhere in the body. As a matter of course, serology, blood studies, blood pressure estimations, urinalysis and other essential examinations will have been done. Obscure cases may require careful examination of one or more of the body's systems. Sometimes a patient may have long complained of headache, minor vertigo and generalized sensory disturbances; the possibility of an arachnoiditis affecting the brain and spinal cord should be borne in mind. Aristotle[1] has said that the object of his treatise on Ethics, is not merely that we may know what virtue is, but that we may become virtuous, else, it is mere speculation and is useless. In a similar vein I have inquired into the nature of vertigo, not merely as a matter of scientific interest, but in order to bring some help to the doctor for whom dizziness is an every-day problem. An outline of treatment may be suggested.

TREATMENT

1. In the *toxæmic* type of case. Habits as to alcohol and tobacco are regulated. Habits as to drug administration should be looked into. In the air force, for instance it has been noted that the sulfonamides cause dizziness and reduced alertness; air pilots taking these drugs are grounded. Drivers of cars may need similar supervision. If the history brings out the detail of exposure to benzol, cyanides, carbon monoxide or other dangerous fumes, suitable measures of treatment and prophylaxis are indicated. Vague malaise and dizziness are often traced to a defective coal furnace or car's exhaust system; sewer gas may also be an offender.

2. In the *infective* cases. The best treatment for the vertigo associated with suppuration, is the treatment of the suppurative condition, *e.g.*, purulent otitis media with its many complications. The vertigo of tubal obstruction with retracted drum responds well to Politzer and catheter inflations and where necessary the removal of adenoid vegetations from the pharyngeal origin of the tube. Vertigo associated with neuro-syphilis, or other infections of the brain will require its appropriate treatment, however unpromising the outlook may seem. As to focal infection, I believe that it is proper to eliminate foci of infection, provided the effort is not too enthusiastic and that the consideration of other causative factors is not neglected.

3. In cases where the dizziness seems incidental to disorders of metabolism the treatment is self evident.

4. In cases where defective function of some one or other of the body's systems is a possible cause of dizziness, it is well to remember that the sense of well-being from the elimination of eye-strain through a proper refraction may do much to restore the confidence of a patient whose episodes of dizziness have brought on a neurasthenia. Correction of errors of refraction is important for people subject to travel sickness. Since the greatest single upsetting factor is fatigue, susceptible persons, before taking a long trip by car, train, or plane, should be well rested, composed by a mild sedative, and relieved of constipation. For the autonomic imbalance during the actual trip, belladonna, chloral, and bromide in repeated doses, are of proved value.

5. In the cases associated with organic changes, very definite lines of treatment are now followed out. In Ménière's syndrome the Furstenberg plan of a sodium-free diet is advocated. Salt and baking soda are forbidden. Fruit, vegetables and milk are limited, but water in moderation is allowed. Six, 7½ grain capsules (not the enteric-coated tablets), of ammonium chloride are taken three times a day *with* meals (*not* before or after eating), for three days and omitted for two days. If the patient is asymptomatic after six weeks of this regimen, the ammonium chloride is omitted, but the salt-free diet is continued for another six weeks. If then still symptom-free, a little salt is used in the cooking. Return to the complete regimen is indicated if symptoms recur.

Miles Atkinson[2] finds, on the basis of a cutaneous test, that the cases of Ménière's syndrome may be divided into two groups. One group is sensitive to histamine and is treated by gradual desensitization to it; while the other is not sensitive to histamine and responds well to nicotinic acid, which apparently may be given over long periods with steady improvement.

In spite of these more conservative measures, associated of course with general supporting treatment and the building up of the patient's morale, a Ménière's syndrome may incapacitate a patient for any form of work. In such cases, fortunately rare, section of the vestibular branch of the auditory nerve, is curative.

In a patient with vertigo, the existence of asthma, hay fever, eczema, or other allergic manifestation, calls for an investigation of his allergic relations, if the dizziness cannot be otherwise accounted for. Allergic vertigo may be benefited at times by necessary changes in the diet, and, where indicated, by desensitization.

The vertigo and headache seen after head injuries is at times a matter of concern to those interested in compensation work. Penfield[6] believes that early lumbar puncture is the best preventive of this complication, while the duration of bed rest may be of little importance. Unless the patient is skilfully managed and returned to some sort of work at the proper time, a post-traumatic neurosis may develop. The headache is apparently due to a pull on sub-dural adhesions at the site of the blow, and is aggravated by fatigue, mental effort, exertion, and the use of alcohol; the dizziness is induced by stooping and lasts a minute or more. The treatment advocated by Penfield is spinal insufflation of air; the air is carried to different parts of the sub-dural space, causing the brain to pull away and thereby breaking the adhesions. The brain then assumes its normal resting place within the sub-dural space.

6. In cases associated with new growth; early diagnosis is all important, and, if successfully made, will spare the patient unnecessary local treatment directed to the ear, nose and throat. Neurological consultation should be sought early, since undue delay in an operable case may cost the patient his sight.

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1290 Ottawa St.

CONDYLOMA ACUMINATA OR GENITAL WARTS IN THE FEMALE

(Report of a case)

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GENITAL warts are often called venereal warts, gonorrhœal warts, or venereal vegetations. They may exist in the absence of any venereal disease and in the female are usually situated in the vulva or around the anus. They vary in size from discrete excrescences to masses the size of a fetal head and may be sessile or pedunculated. During pregnancy they often increase considerably in size and decrease or disappear entirely afterwards. Wilson[1] suggests that this increase during pregnancy may represent an action similar to the carcinogenic effect of œstrin.

Incidence.—Speiser[2] found two cases in 1,000 gynæcological admissions to Bellevue Hospital. The Ottawa Civic Hospital had 9 cases in 8,060 gynæcological admissions from 1936 to 1943.

Etiology.—The consensus is that the etiological agent is a filterable virus (Wilson,[1] Speiser,[2] Bogetti, Serra). A few, including Lipschutz, hold that the cause is a chlamydozoan, whilst still others (Dreyer, Favre and Civatte, Guerin) believe that a particular spirochæte is the causative agent.

Thus, these genital warts are infectious and may be spread by direct contact. Wilson reports two cases spread by direct contact and without any evidence of gonorrhœa or syphilis. Dracoulides[3] presents the case of a man, age 28 years, who came with two small venereal vegetations on the inner and outer surfaces of the lower lip. He acknowledged having an abnormal contact with a woman who had a small vulvar vegetation some three months earlier, and inoculation took place through a herpetic fissure which existed on the lip at that time. Occasionally, there is associated with the genital warts, the common warts on the hands or other parts of the body, suggesting a common etiological factor.

Pathology. — The morphological aspect of condyloma acuminata is due to marked hypertrophy of the papillæ of the skin, enormously elongated and ramified, crossed by numerous blood vessels with wide lumen and thin walls, all covered by a thickened epidermal layer, parakeratotic because of marked proliferation of the germinative layer.

Diagnosis.—Dark field and blood serological tests distinguish these from syphilis. Carcinoma begins to ulcerate, become friable, necrotic and bleeding. Biopsy yields a distinct picture of malignancy.

Symptoms.—In addition to the proliferations on the external genitals, which occasionally interfere with walking, there is frequently induced micturitional pain when located near the urethra. When large, there is usually discharge and an offensive odour; occasionally, when injured they bleed.

Treatment. — Condyloma acuminata increase the chance of blood loss during delivery and puerperal infection. They should be treated during pregnancy. A great many chemicals have been used, with varying success, in removing genital warts. Biberstein[4] and Conde[5] report on the use of immuno-therapy, and whilst the former is enthusiastic, the latter's results are inconclusive and he has had to resort to electrocoagulation. The vaccine is prepared by triturating recently extirpated condylomata in a mortar and left to autolyze at room temperature for 24 hours. It is then sterilized at 60° C. for an hour. Chenelewsky[6] recommends use of the quartz lamp and, though he reports good results with 18 to 20 treatments, his series is far too small to be conclusive. He begins treatment with five minutes' duration at 50 cm. and gradually decreases the distance to 30 cm. and increases the time to thirty minutes. The healthy skin must be protected.

Walters and Hesseltine[7] report excellent results with the use of radium. They treated eleven cases, using an average dose of 100 mgm. hours applying 50 mgm. tube for two hours. Schmitz records 13 cases treated with radium and x-rays with recovery in 11.

Electrocoagulation alone in the case of small vegetations, or electrocoagulation with the use of the scissors or scalpel in large growths, ap-

pears to offer the best results. The small warts can be treated under local anæsthetic, while the very large ones may be done under pentothal intravenously. Where very large growths are removed with the scalpel the bleeders are caught with artery forceps and then electrocoagulated. Since the huge growths cannot be adequately sterilized, the raw area left after excision and coagulation should be filled with sulfathiazole, and sutured together, inserting a small rubber tissue drain to remove any serum which might form.

CASE REPORT

History.—The patient, aged 18, an Algonquin Indian, unmarried, and the mother of an 18-months' old baby, presented herself on June 22, 1943, with the complaint of a large growth on her vulva of 19 months' duration. She stated that the mass began about a month before the birth of a full-term child, reaching its present size in two weeks and remained unchanged afterwards. The mass interfered with her walking and hung between her thighs.

Menstrual history was normal. Since the birth of her baby, 18 months ago, she has had only one period. She did not nurse her baby. Leucorrhœa had been profuse and foul-smelling for the past two years. She has no urinary nor gastro-intestinal disturbances.

Family history.—Father and mother alive and well. One sister has tuberculosis.

Present complaint.—She is a fairly well nourished slight girl, weighing 110 lb. with the bronze skin typical of her race. There is a foul odour about her. Temperature 98°; pulse 88; respirations 20; heart and lungs normal. Blood pressure 130/80, urine 1.020, albumin 0, sugar 0, a few epithelial cells, a few pus cells (non-catheter specimen). Blood examination: red blood cells 4.070,000, white blood cells 6,350, Hb. 10.2 gm. or 67%. Blood sugar 86 mgm., non-protein nitrogen 24 mgm. The patient had no warts on the rest of her body.

The vulva presents two huge masses, one on each labium, foul smelling, of papillary type (see Fig. 1). The masses extended anteriorly over the mons and posteriorly over the perineum. In addition to the large masses there were a considerable number of small discrete growths both on the skin and on the labia minora. The inguinal glands were enlarged.

The urethra was normal. The cervix showed subacute inflammation and a direct smear and culture under reduced oxygen showed the presence of gonococci, Gram-negative intracellular and extracellular diplococci. The uterus was of normal size, anteflexed and mobile. The adnexæ were painless and not enlarged.

Dark-field examination of the vulvar masses showed no evidence of *Treponema pallidum*. Serological blood tests for syphilis were negative on June 30, 1943, and July 6, 1943. The diagnosis was, genital warts, gonorrhœal cervicitis, and ovarian dysfunction (amenorrhœa).

She was given 15 grains of sulfadiazine by mouth every six hours to cure her gonorrhœa. Her blood sulfadiazine was kept at 5 mgm. Sitz baths were carried out daily, to help clean some of the debris and dissipate the odour.

Operation.—Since the masses were so large and the bases so wide, the operative procedure was carried out in two stages. On June 26, under intravenous pentothal anæsthesia, the large masses were excised with a scalpel, the bleeders caught with artery forceps and then coagulated. Numerous small excrescences were electrocoagulated. In order to avoid denuding too much skin, a few masses on the thighs were left for a subsequent operation. The cavities left by removal of the growths were filled with 75 grains of sulfathiazole, small Penrose drains were inserted in lower end of wounds, and the skin on both sides was approximated with dermol sutures. Since some of the warts were removed from the vestibule, a v. Pezzer catheter was inserted into the urethra for five days. The drains were removed on the third day and sutures on the tenth day. There was a slight sero-purulent discharge from the left wound, and sitz-baths twice a day were started on the twelfth day after operation. On July 28 smears and cultures for gonococci were negative. On July 29, when the primary wounds were all healed, she was taken to the operating room a second time and, under pentothal intravenous anæsthesia, the remainder of the smaller warts were excised and the bases electrocoagulated. These did not require suturing. Sitz baths were started immediately and on August 20, she presented the condition shown in Fig. 2.

Fig. 1

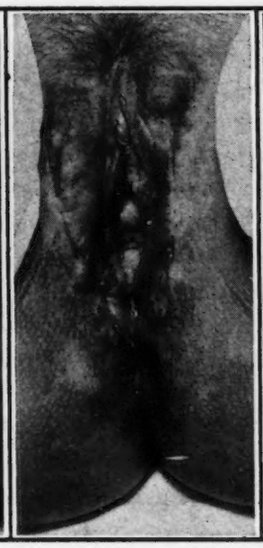

Fig. 2

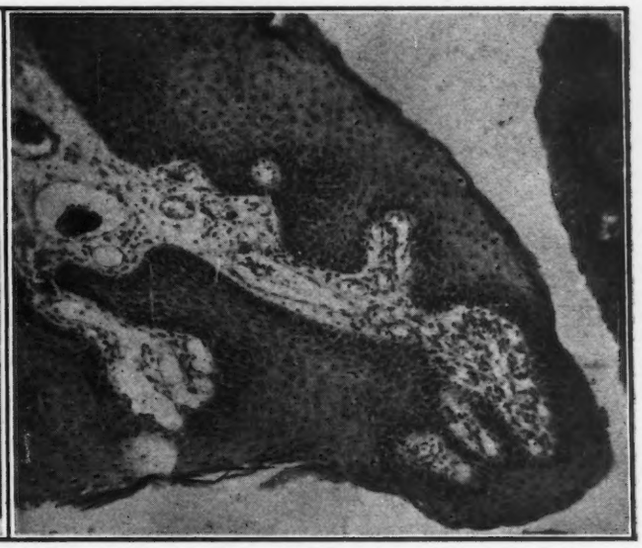

Fig. 3

Pathological examination. — The gross specimen, weighing 2¾ lb., consisted of four irregularly shaped masses of lobulated and papilliferous tissue, the largest measuring 10 x 6 x 5 cm. The various lobules were studded with numerous small white nodules. On section the specimen contained a central cystic and hæmorrhagic stalk, attached to which were numerous white stalks. Microscopically the specimen consisted of a central branching fibrous stalk-like stroma clothed by an extremely thick layer of proliferating stratified squamous

epithelium thrown up into irregular papilliferous folds. The lesion was moderately vascular, œdematous and heavily infiltrated with lymphocytes and plasma cells. Scattered deposits of old blood pigment were present throughout (Fig. 3).

Diagnosis: Condylomata acuminata.

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334 Kent St.

MEDICAL EDUCATION: INTERNS AND RESIDENTS*

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MUCH has been written on this subject, as a cursory review of the literature reveals, but one recurring thought is common in all articles, namely, that the hospital has a definite responsibility in the training and teaching of its intern and resident staffs.

The whole field of graduate medical education should provide an educational content for the intern and resident that will result in a better trained medical profession, with a keener desire to keep abreast of developments in medical facts, and with a clearer realization that medical education is a continuous process, extending throughout the physician's lifetime. The essential purpose of all this is to provide better medical care and preventive medicine to the community at large.

Medical practice is in a state of ebb and flow. Our profession is one in which there is continuous advance and progress. So must all phases of medical education also change. Thus graduate education, after the customary four years in college must be accorded the deepest consideration, so that it may be clearly visualized and arranged in an orderly manner.

The field of graduate education is logically divided into three groups, or rather three parts. The first is the internship, which rounds out, and gives practical application to the medical school course, and also accustoms the individual, under supervision, to an assumption of responsibility. The second part is the residency, which prepares a physician for the practice of a specialty. Finally, there are courses of varying length termed postgraduate courses that aim to keep practitioners up to date in their fields of practice.

The internship, closely integrated with the clinical clerkship, enables the graduate to see all aspects of his patient, and view him not only as an individual, but also as a person. The residency provides special training in a special field, and is the most effective, economical, and satisfactory method of obtaining this training.

In any program for improving graduate medical education, particularly those parts relating to the internship and the residency, the hospital occupies a key position. The hospital administrator, Medical Board and Board of Management, must realize the vital importance of the rôle of this educational program, and the importance of this program in improving service to patients.

Hospitals have no right to invite or accept interns, nor should university medical schools permit their recent graduates to intern at hospitals where no organized attempt is made at providing graduate training.

Internship and residency connote but two aspects of one and the same thing, namely, medical education of the recently graduated in medicine. Internship can be considered as but a step towards residency, if one thinks of residency in terms of a straight service, *e.g.*, medicine or surgery, and for which a preliminary internship is a prerequisite.

In normal times, the one year postgraduate internship, rotating or straight, is no longer sufficient to train a medical graduate for general practice, let alone a specialty. The practice of medicine demands a longer period of basic intensive training, and further study. Fundamentally, there should be little difference in the program of education for a physician who goes into general practiee, or for one who plans a specialty, for as we must avoid developing specialists with a limited general background, so too must we provide practitioners with sufficient training to provide adequate general medical

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services in a community which is his area of responsibility; and as this responsibility grows, so too will his importance and prestige become greater.

There has always been controversy as to the educational benefit derived from a rotating or straight internship. Certainly it has been our experience at the Montreal General Hospital that a rotating internship serves the graduate best, whether he goes into general practice, or follows a specialty. The tendency to go into a straight surgical or medical internship immediately on graduation is, from our experience, not recommended. We believe that the first prerequisite for the recent graduate who is desirous of following a specialty is to take a rotating internship followed by a year of pathology or other basic science, in order to gain a sound basis for the future specialty. In all training offered the recently graduated, a basic knowledge of bedside medicine and surgery is essential as a preparation for any future type of work, and bedside teaching by staff members and residents should provide a knowledge of the commoner medical and surgical conditions, with special attention being paid to diagnostic and therapeutic technique. This is a fundamental need in any program of the intern's education. Our experience of interns, especially over the past decade, proves to our satisfaction that their basic needs are best met in a rotating internship and, if possible, on a two year basis.

In view, however, of the national emergency through which we are passing, the immediate concern of hospitals should be to provide internships so balanced that they will fulfil the essential requirements in consolidating the academic knowledge of the recently graduated. In this regard, it must be borne in mind that the recently graduated are tomorrow's potential medical officers for the Armed Services. Therefore, in times of national emergency, the greater emphasis must be placed on the medical education of the *intern*, rather than on the resident, though naturally that must not be overlooked.

The hospital in wartime has two broad functions to perform, firstly, the providing of a basic graduate training so as to fit the potential medical officer for his future duties and secondly, the training of the medical officer as the potential civilian practitioner.

Let me repeat that the main consideration facing hospitals at this time is the providing of internships so shaped that the recently graduated may learn, "the how it is done", as distinct from, "the why it is done", of the university teaching.

In all this training, the thought must not be lost sight of that eventually those recently graduated, in a shorter or longer period, are going to assume responsibilities of the peace-time practice of medicine, and that in order to safeguard and maintain the highest standards in the practice of peace-time medicine, steps must be taken to provide the potential medical officer and the medical officer, after stated periods of service, with post-graduate training, not only to make him a better medical officer but also to increase his value as a potential civilian practitioner. This latter factor must receive thoughtful consideration; for the future quality of medical practice is open to question as to just what the community as a whole is going to receive in the first decade after the declaration of peace. Unless those graduated since the onset of the national emergency are to receive what might be considered a peace-time norm of postgraduate medical training, which under normal peace-time conditions would not have been limited to but a compulsory nine-months' period, one cannot help but feel nervous as regards the future of peace-time medical practice, especially when one sees that no small proportion of the recently graduated in medicine come into hospital today undertaking the compulsory internship with but the thought that this compulsory internship is a necessary evil to be put up with until they can don the uniform of a medical officer in the Armed Forces. This results in a lack of enthusiasm on the part of the intern towards conscientiously obtaining as much benefit as he should out of his internship, which was not seen in pre-war days. It is evidenced in the laxity with which case reports are written; with the desire to be clear of work by 5 or 6 o'clock at night, to be living out of hospital up town in an apartment with his wife, and a general desire for a greater measure of the *joie de vivre* so evidenced in wartime.

What does this portend for the future of medicine? This is a question which cannot help but strike the thoughtful with real concern. One is already seeing what is happening. The recent graduate immediately after his compulsory internship becomes a member of the Armed Forces. In a short time he gets married.

He can afford to do this because at an earlier period in his medical career he is earning sufficient to do so. Marriage then brings further responsibility. When that officer is discharged from service, what are the possibilities of his going back to postgraduate work? The opinion is ventured that in a large number of cases such a return is not likely to occur, purely because of responsibility and lack of financial resources. That group who have taken on family responsibilities must immediately seek the financial means to support his family, hence is it not reasonable to assume that he will turn immediately to general practice? Is it not, therefore, conceivable that the practice of medicine in the community as a whole will suffer considerably unless steps are taken to provide postgraduate facilities either during his service as a member of the Armed Forces or immediately on the cessation of hostilities.

University civilian hospitals and military hospitals also to some extent can play a very fateful part in the medicine of the future by providing postgraduate courses to which the Armed Services will send officers for instruction, either during their term of service or on the cessation of hostilities. Such a course was planned at this hospital some months ago. It was of three months' duration. An intensive program was arranged covering many subjects, with the result that those who took it felt that a great deal had been obtained, valuable not only from the point of view of military medicine but also from that of civilian medicine.

As a war-time measure, we are more convinced than ever that to meet the needs of internship from the viewpoint of both the recently graduated and the supplying of potential officers to the Armed Forces, the best means of doing so is through the rotary internship service. Those rotations should be so grouped and balanced as to provide the intern with a fairly comprehensive series of services which will best fit him for the immediate job he has to fulfil, namely, that of a medical officer of the Armed Forces, rather than the straight internship devoted to one branch of medicine such as general surgery or general medicine. The latter comes more within the realms of what can be offered for those seeking training as residents.

At the Montreal General Hospital we offer some eleven rotations, each of which is based on a year period of internship and includes three months on each of four services. For example, rotation 9 comprises three months on public medicine, three months on surgery, three months on surgical outdoor and specialties and three months on obstetrics. Then again, another includes three months on private medicine, three months on public surgery, three months on surgical outdoor and three months in pathology. The idea is to give a variety of well balanced rotations.

In addition hospitals must set up certain organized teaching, as complementary to the day to day bedside teaching of the individual staff members. Every hospital has a definite responsibility, no matter whether it be a large teaching hospital or a small rural hospital, to teach its interns whether remuneration be offered or not. Fear is expressed that far too often the thought on the part of certain hospital boards is to obtain the free services of a medical graduate who will take on a twenty-four hour tour of responsibility for patients in the absence of attending staff men. This is not playing fair by the recent medical graduate nor should it be tolerated or permitted by universities. The universities should ensure that the hospitals to which their students go on graduation are so fitted, by their staff organization, that the recent graduate will not be expected to be merely a "stop-gap", but that there will be a *quid pro quo* in which he will receive for services rendered a well rounded out course, featuring bedside teaching, so that the basic sciences and clinical work which he has been taught in medical school may be applied practically.

Now with respect to the fundamental features the system of graduate medical education must provide, the intern is to be given the initial responsibility of a complete history and physical examination of his patient. He should also act in the capacity of supervisor of the medical students posted to his ward and check their histories and physicals. He should give all routine orders on all his public cases, and be allowed, under supervision, the management of these cases. He should be called for emergencies, grasp the situation, and notify the resident. There should be organized rounds at least once weekly, at which time the intern should present his cases, and have the benefit of a full discussion with the resident, attending physician, and the chief of service. At this time serious problems should be considered and procedures decided upon. The hospital should provide weekly

clinical pathological conferences, when necropsies may be discussed in relation to histories and treatment, and at which the interns should be encouraged to take an active part. Clinical conferences should be held weekly. At this time interesting and not necessarily unusual cases should be presented for their teaching value. Diagnosis, prognosis and treatment should be freely discussed. Conferences on x-ray study and therapy should be held weekly, so as to correlate clinical findings with radiological findings. Hospital staff rounds, surgical, medical and specialties, should be attended by all interns, and they should be encouraged to take an active part.

An adequate and comfortable medical library is absolutely essential to any program of medical education in which in addition to the standard texts the leading medical journals should also be found. An intern society should be sponsored by the hospital, and meetings held once weekly. At these society meetings, the attending staff should take turns in discussing interesting subjects and new therapy or technique, but all papers should be of a general nature, so as to interest the greatest number. Interesting cases should be presented by the interns at this time, and open discussion between interns and staff members fostered.

The question may well be asked how can all such conferences and ward rounds be welded into an organized whole? By an active and enthusiastic interest on the part of the staff members in the interns, their work and day to day problems. In a large teaching hospital one of the younger staff members interested in teaching should be appointed a Fellow, granted a fixed honorarium, whose duty it would be to see that a regular program is arranged and followed in conjunction with the chiefs of various services. In this manner he could organize the clinical resources of the hospital, so that the opportunities for education of the intern and resident would be fully developed. It should be his responsibility to act as liaison between staff members, interns, and resident staffs, in order to ensure that the interest of the interns and of the staff is being continuously stimulated and maintained in keeping before all the latest advances in the field of medicine.

What is the ultimate aim and sure result of such a program? It is to provide a better equipped medical man, armed for the prevention of disease, and prepared to do his part in the improvement of medical service to the people of his country. A good program of graduate medical education will make the hospital internship sought after, and lack of interns will not be one of the problems.

For the graduate who is not callable for the Armed Services, an organized internship leading to residency and covering a longer period of time can be fitted in side by side with that of the wartime internship. In fact it is but a further step from the wartime internship and it is our experience that the rotation service as a prerequisite is equally valuable for the long term internship as it is for the short term internship. The rotation service for the graduate who is able to intern for two or three years, provides him with a means of consolidating his college teaching and selecting the path along which his future medical career may lie. If he decides to go into general surgery or general medicine, he should at least take a straight year of physiology and pathology as a first step and then one or more years in his selected field of medicine, surgery or specialty.

SUMMARY

1. Whether it be intern or resident service that the hospital offers, it must be organized teaching and the staff members must assume full responsibility for bedside teaching.

2. Due to the exigencies of the national emergency, the compulsory internship should be on a rotation basis with well balanced services so chosen as to best meet the needs of the potential medical officer.

3. University responsibility should not cease with graduation, but it should ensure that the recently graduated go to only those hospitals which have organized teaching for the intern; in other words the immediate postgraduation internship should be considered as part of the University curriculum.

4. Certain selected officers from the Armed Services should be posted to hospitals as residents for training.

5. Frequent intensive postgraduate courses should be organized to which medical officers of the Armed Forces may attend either to increase their value as medical officers or civilian practitioners.

6. The hospital, especially the University Teaching Hospital, should have a Fellow appointed to arrange, encourage and stimulate medical teaching of the intern and resident.

RÉSUMÉ

Qu'il s'agisse de l'interne ou du résident, il importe que l'hôpital offre à ceux-ci une organisation parfaite de l'enseignement médical et que les médecins de la maison assument l'entière responsabilité de l'enseignement au lit du malade. L'internat obligatoire doit permettre au jeune médecin de séjourner dans tous les services selon un plan qui permet, le cas échéant, pour certains sujets de prolonger certains stages. Les responsabilités de l'université ne doivent pas cesser après la collation du diplôme; la direction universitaire doit diriger les jeunes internes sur les seuls hôpitaux qui possèdent un enseignement clinique bien organisé. L'internat doit, en d'autres termes, faire partie du curriculum universitaire. Certains officiers médicaux de l'armée doivent bénéficier des avantages de l'internat; il faudra à l'occasion leur assigner un poste d'interne ou de résident. Dans le même ordre d'idées, il faudra fréquemment organiser des cours additionnels, dits postgradués, pour les médecins de l'armée. Un officier médical spécial, un *Fellow*, nommé par l'hôpital ou par l'université devra présider à l'organisation et au maintien de l'enseignement médical donné aux internes et aux residents.

JEAN SAUCIER

A TYPHOID EPIDEMIC IN SOUTHERN ALBERTA

By F. W. Gershaw, M.P., M.D.

Ottawa

ABOUT seventy cases of typhoid developed in southern Alberta this spring. The Provincial Health officers made a very thorough investigation as to the source of the infection. Practically all the original cases had one thing in common. They had eaten Cheddar cheese, produced at a certain cheese factory, between February 5 and 10, 1944. There seems to be little doubt but that this cheese was infected although in testing samples of it seven weeks after it was produced the laboratory technicians were unable to isolate the typhoid organism. This does not by any means prove that the infection was not cheese-borne, as it has been shown that typhoid germs can remain alive in cheese for as long as six months, depending on the temperature.

The cases were of a severe type. There were many serious hæmorrhages, at least one perforation, severe toxæmia and long-continued fever. There may be more contact cases from time to time.

It seems that Cheddar cheese is referred to as raw cheese and is not pasteurized in Canada. It is not processed as is packaged cheese. The question of having a Dominion regulation about pasteurization of cheese and the storing of it for a longer time is being considered.

After a diligent search the Provincial officers discovered a typhoid carrier who had been supplying milk to the factory. The milk after reaching the factory was placed in a 500 gallon vat. The temperature is raised to 100 degrees and then cooling is allowed. If there were germs present they would multiply rapidly, as this makes an ideal culture medium.

The fact that so few contact cases have developed in this instance is a tribute to the Alberta Health Department. They have taken steps to control the infected persons, to destroy the infected material and to protect many as far as inoculation will protect. It has been amply shown that inoculation is of great value, although its effect is not at all permanent and it will not protect against massive infection.

The money costs of this epidemic to hospitals and individuals will run to a million dollars. This is, of course, not so important as the sad loss of useful lives and the long periods of disability caused by this preventable disease.

Twenty-five per cent of typhoid cases are due to carriers. Carriers come under three classes. There is the incubation carrier who spreads the germs before symptoms develop or during the whole course of mild walking cases. There is the convalescent carrier who excretes germs for three months after the disease. There also is the chronic carrier who is a source of danger for an indefinite period. One-third of the cases become convalescent carriers and more than 5% chronic carriers. In 1930 there were 527 carriers in New York State.

There have been two other cheese-borne epidemics in Alberta, and at least ten have been reported in Canada.

House of Commons, Ottawa.

The quality of medicine depends on the quality of its entrants. Whatever you do, do nothing which will result in denying to the profession its due proportion of the best brains of the new generation. That will be the result if medicine is looked upon as a rigid and stereotyped form of service.—Dr. Chas. Hill, *Brit. M. J.*, March 25, 1944, Supp. p. 60.

TUBERCULOSIS CONCEPTS THEN AND NOW

By D. F. McRae, M.D.

Ninette, Man.

ONE of the chief drawbacks to better achievement is that we fail to compare and evaluate the things of today with those of yesterday, or, better still, the day before yesterday. Yesterday is too close; yesterday we had already entered upon the mad rush and tumult of the twentieth century. In preparing the following paper I compared some early Victorian concepts in the field of medicine with those of today and the conclusions arrived at are not entirely in favour of the clinicians of 1943.

I have before me as I write, *The Science and Practice of Medicine*, by William Aitken, M.D., Edin., printed in its 2nd American edition "from the 5th London edition" by Lindsay & Blakiston, of Philadelphia, in the year 1868. It is fair to assume that Dr. Aitken's presentation to the English-speaking practitioners of 1868 was an up-to-date treatise on medicine and that the concepts outlined in his book represent the best accepted scientific opinion of the day.

Let us compare these concepts of 1868 with the concepts of 1943 in respect to the subject of tuberculosis; first, however, we must orient ourselves in respect to the time in the world's history represented by the year 1868. It does not do merely to state that the year 1868 antedates the year 1943 by exactly three-quarters of a century; for a better understanding of the matter we purpose to investigate we should remember that 1868 fell in the twilight of a brilliant era of medical research and achievement; an era that had produced such men as William and John Hunter, Cullen, Baillie and the three Munros in Scotland, Brodie and Jenner and a whole galaxy of outstanding men in England, Lavoisier and Laennec and the Paris School of Medicine, an era that was still graced by the presence of such notable men as Pasteur, Paget, Hutchinson, Virchow, and Rokitansky, and Villemin who had propounded the doctrine of "specific tubercle inoculation".

It was this doctrine of specific inoculation which was, in its outcome, to usher in a new era, the wonders and achievements whereof we have not yet seen the end.

We may well call the century before 1868 "The Anatomical Era" of medicine, for it was the great discoveries in the field of anatomical and morbid-anatomical research that raised it to so high a pinnacle of brilliance as compared with all the centuries that had gone before. In a similar way we may designate the years since 1868 "The Bacteriological Era" of medicine, for at that very time were taking place the studies and investigations which were to blossom forth in a short fifteen years in the discovery of the tubercle bacillus as the cause of tuberculosis, (the so-called "scrofulous order of diseases") and, as a sequel, the discovery of many other bacterial instigators of diseases we are familiar with today.

Dr. Aitken as the good conservative writer of textbooks that he was, sticks fast to the accepted theory of the constitutional origin of the scrofulous order of diseases, and in the 76 solid pages he devotes to the subject of tuberculosis the only mention he makes of the controversy which must surely then have been raging in the halls of medical congresses throughout Europe and America in regard to the possible germ origin of tuberculosis is this:—

> "In the recent protracted and unfruitful debates upon Phthisis in The French Academy of Medicine Doctor Bouilland (Boullaud?) added, 'The tuberculosis virus is an hypothesis which up to the present time rests upon no exact or trustworthy observation and there does not exist a single instance of tuberculosis of the lungs or of any other part of the body being produced in the human species by means of specific virulent inoculation'."

One gets the impression that the editor of Aitken's *Science and Practice of Medicine* was in whole-hearted agreement with those who so whole-heartedly condemned Villemin's doctrine of specific tubercle inoculation.

It is astonishing to think that William Aitken and his American editor, Meridith Clymer, should be so unimpressed by that little cloud in the sky, the germ theory of the origin of tuberculosis, which was so soon to overturn the very foundation of their elaborate and painstakingly perfected scheme of constitutional disease, a scheme which had been some five thousand years in the building, but built upon sand, as the research of Villemin, Koch and their co-workers was soon to demonstrate beyond all shadow of doubt. Astonishing is the fact that the structure of treatment of phthisis which they had reared upon this erroneous foundation survives without essential change in the treatment of tuberculosis today, except that we have elaborated the principle of local rest of the affected part. But more

astonishing than all else is the fact that a pathological concept, reared on the quicksand of the constitutional theory of the origin of tuberculosis should find a place in the minds of our clinical leaders in tuberculosis at the present time!

William Aitken writes:—

> "A considerable portion of the scrofulous exudate may transude in the fluid state, in the first instance through the capillaries, and collect in those places outside the vessels that offer least resistance . . . therefore *infiltration* more or less extensive is the first condition in which the exudation can be observed to exist", and again; "tubercle occurs as an infiltration of the tissues by an albuminous fluid of a thick synovial character which gradually degenerates into a firm greyish-red granular softened mass".

Aitken gives credit to Baillie in his treatise, *Morbid Anatomy*, for the first description of infiltration. One may wonder whether Baillie, if he were alive today, would feel complimented that the roentgeno-clinical teachers of The Bacteriological Era of medicine with a proved germ origin of tuberculosis to guide them instead of a mere constitutional theory, (the best he had on which to form his concepts), and one hundred years of added observation and investigation with facilities beyond his dreams, could not furnish a better concept for the instruction of the enquiring student than his own old concept of infiltration occurring in pulmonary tuberculosis.

For example, one modern teacher in describing x-ray films says: "One receives the impression that these areas show diffuse infiltration", and later in the same article, "The shadows form a network of stringy markings and there are no nodular infiltrations". A second teacher in describing films writes: "Note infiltrates in upper lobe", "Note large calcified infiltrate in right upper lobe", "The x-ray film reveals only an excavating infiltrate".

Here we have two outstanding writer-teachers describing tuberculous lesions of the lung as seen on the x-ray film, and for their descriptive phraseology they can do no better than repeat Baillie's term infiltration, adding to it their own particularization of "diffuse", "nodular", "calcified", "excavating".

This loose indeterminate use of the word, infiltration, is not limited to the pundits of tuberculosis, but is to be found in the film readings of roentgeno-clinicians across the land. Their only attempt to get nearer to a truly descriptive pathological concept is to add imaginative adjectives of the widest variety to qualify their concept of infiltration. In the pages of one of our journals one finds, "snow-storm effect", "woolly shadows", "salt and pepper appearance", "cirrose clouding", "ground-glass effect", "sea-fog effect", "cob-web effect", "stippling", "studding", "mottling" and still other terms to reach the bounds of imagery.

I feel sure that Baillie would draw his blue pencil through every repetition of his concept of infiltration and grimly bid the users employ terms more fitting and more accurately descriptive of the pathological condition producing the shadows seen on the films of proved cases of pulmonary tuberculosis.

He would point out that "diffuse homogeneous shadows within the lung" are caused by the secondary phase of tuberculous infection wherein "there is added an inflammatory exudation the result of allergic hypersensitiveness", as taught by Boyd.[1] He would point out that nodular formation in the tuberculous lung is the result of "a productive reaction with new tissue formation," and that this is "the morbid unit of tuberculosis" and not to be confused with the exudative phase of the disease. He would point out that stringy shadows in contrast to diffuse or nodular shadows are characteristic of fibrosis within the tuberculous lung. He would demand that teachers and demonstrators should as clearly as possible differentiate these shadows on the film and describe them in cogent terms for their pupils, instead of wrapping them up in the indefinite unrevealing term *infiltration*, which befitted his day and his concept, but is wholly inadequate to give a just concept of the pathological picture today.

Nor is the above the only instance of lack of clear thinking on the part of modern writers. Aitken writes: "Pathologists are now agreed that the production of tubercle is quite independent of inflammation . . . but that in the great majority of cases inflammation is set up around the tubercle-masses and plays an important part in further production of tubercles".

Aitken's pathologists had come up against the phenomenon of allergic hypersensitivity in secondary tuberculous infection, and, although they were unable to account for this seemingly dual nature of the disease, nevertheless they did recognize the two phases and form their concept

of both the tubercle formation and the surrounding inflammation being essentially tuberculous processes. Compare Aitken's concept with that of one of our twentieth century literati who writes: "It is not possible to draw a sharp line of distinction between the symptomatic effects of the tuberculous focus and the non-specific inflammation associated with that focus". Non-specific forsooth! There is scant recognition here of the phenomenon of secondary tuberculous infection characterized by inflammation as outlined by Boyd and which he calls *allergic hypersensitiveness.*

The discovery of the germ origin of tuberculosis antedated by a generation our present concept of allergic hypersensitiveness and during that time the "inflammation set up round the tubercle-masses" in pulmonary tuberculosis was largely attributed to secondary mixed infection. Other organisms were visualized as sneaking in in the wake of the tubercle bacillus and setting up business on their own account in symbiotic harmony with the first invader. This concept of a secondary mixed infection present in open cases of pulmonary tuberculosis is still with us as the above quotation illustrates, and results either consciously or unconsciously in the exclusion of a concept of allergic hypersensitiveness setting up inflammatory changes surrounding tuberculous foci.

No doubt pathologists recognize perifocal inflammation at its true value, but apparently clinicians do not, and, because we have come to depend almost wholly upon the interpretation of x-ray films for our concepts of the tuberculous lung in all its phases, there is a lack of understanding regarding the part allergic hypersensitivity plays in pulmonary tuberculosis. It may with some truth be said that Aitken's concept of the phenomenon of secondary tuberculous infection was closer to the actual condition than that of many of our modern clinicians!

The faults lie in the weakness of our x-ray interpretations and in the lack of an adequately expressed pathological classification of pulmonary tuberculosis. The second of these faults, the lack of an adequate classification, is a corollary of the first, for, as mentioned above, we have come to depend almost entirely upon the chest film for our concept of the chest lesion. Pottenger,[2] points out that our classifications have always been anatomical, by which he means that they have dealt essentially with location and extent of lesions. A careful analytical reading of the chest film should make it possible to add a pathological classification to the anatomical one and a combined anatomical and pathological classification would be much more useful than the anatomical one alone.

Watt,[3] gives an excellent outline for just such a pathological interpretation of the tuberculous chest film.

The 1940 edition of the U.S.A. National Tuberculosis Association's Diagnostic Standards makes provision for a simple and helpful pathological classification of cases when, among other things, it asks that the dominant pathological phase of exudation or proliferation be noted.

At the Manitoba Sanatorium since 1940 we have used a method of reading chest films in which exudation, proliferation and fibrosis are noted and their relative dominance indicated along with other classifying data in a simple code expression.[4]

We have found this method helpful in giving us insight into the pathological condition of the case as it presents itself to us for the first time. It helps in prognosis, in treatment and in the exchange of ideas. It helps students to a keener perception of what actually is shown on a chest film and we ourselves benefit as well as the students, for this analysis of successive cases of pulmonary tuberculosis brings to us an appreciation of the value of studies in pathology, studies which have been neglected ever since clinicians began viewing the chest through the instrumentality of the roentgen ray.

We are definitely on the side of those who dare, without equivocation and despite the reluctance of conservative-minded clinicians, to express an opinion on the phases of tuberculosis as seen in a film. Our plea is for a wider use and a fuller understanding of the analytic method of film interpretation by clinicians in dealing with cases of pulmonary tuberculosis.

References

1. Boyd, W.: A Textbook of Pathology, Henry Kimpton, London, 1st ed., 1932, p. 288.
2. Pottenger, F. M.: A discussion of classifications of pulmonary tuberculosis, *Am. Rev. Tuberc.*, 1922, 6: 621.
3. Watt, J.: Radiological classification of cases of pulmonary tuberculosis, *Tubercle*, 1937, 18: 433.
4. A paper on this system of reading chest films in pulmonary tuberculosis has not been published, but an outline may be obtained by writing Dr. E. L. Ross, Superintendent, Manitoba Sanatorium, Ninette, Manitoba.

Manitoba Sanatorium,
Ninette.

FIRST AID AND TRANSPORTATION IN CASES OF FRACTURE OR SUSPECTED FRACTURE OF SPINE

By Lt.-Col. G. P. Howlett, E.D., M.D., R.O.

St. John Ambulance Brigade, Ottawa

IN an announcement made in the *British Medical Journal* it was stated that a method of first aid treatment and transportation of cases of fracture or suspected fracture of spine, to be known as the "Clarke-Moir" method, was to be brought to the attention of the Order of St. John, the British Red Cross, and the Order of St. Andrew, after it had been referred to the British Orthopædic Association.

In an earlier edition of the *British Medical Journal,* Lt.-Col. J. L. Moir, one of the sponsors of the new procedure, stated that in his teaching of first aid to the Home Guard he had been impressed with the difficulty the first aid student often seems to have in following and grasping the essentials of first aid treatment of fracture of the spine (a statement that is supported by all medical men who have taught first aid). For some time past, therefore, he has considered that the instruction on this subject should be simplified and standardized, and he quotes H. Osmond Clarke, F.R.C.S., as follows:

> "*Supine position.*—Fracture of the spine at any level should be carried in the supine position on a hard flat stretcher, maintaining as far as possible the normal contour of the spine by inserting a small pillow or pad (*e.g.* a folded garment) beneath the lumbar and cervical spines. It is of the greatest importance that a person with an injured spine should be lifted on to the stretcher with his back supported at several points. If the spine is allowed to sag excessively into a position of hyperflexion or hyperextension, which may occur when a man is lifted by his shoulders and legs, damage beyond repair may be done."

Mr. Clarke's procedure does seem to simplify the first aid treatment of fracture or suspected fracture of spine and makes it unnecessary for the first aider to locate the area of fracture, always a difficult thing for him to do. It also renders unnecessary the turning of the patient on his side, the stretcher on its side, and then placing the patient in the prone position on the stretcher in cases of fracture or suspected fracture of the dorsal or lumbar region. (Practice of the above will show how easily a slip can be made and damage done.)

Lt-Col. Moir's method is supported by the opinion of Professor H. Pratt who wrote to Lt.-Col. Moir substantially as follows:

> "With regard to the first aid teaching of the *immediate handling* of cases of fractured spine, I think there is a laudable tendency to simplify the instructions. The distinction between cervical injuries and those in the dorsal and lumbar regions well enough marked for the expert (doctor) to distinguish is liable to be confusing to those *untrained* people who may and frequently do have to move the patient (out of the danger area)."

Professor Platt continues that he would agree with the teaching that all spinal injuries can be safely transported in the supine position, provided that (1) the natural contour of the spine is maintained, *e.g.,* by appropriate pillows. (2) No flexion movements or extreme hyperextension movements are permitted during the lifting (handling) of the patient. He adds, "I do not think this subject has recently been debated by orthopædic surgeons, but most of them would be keen on having a simple standardized method laid down for the guidance of the non-expert".

Lt.-Col. Moir states that the method referred to by Professor Platt was the one suggested by himself to be used as standardized treatment for all fractures or suspected fractures of the spine at any level, by all first aiders, as immediate treatment. In all cases where there is a history of accident or injury to the neck or backbone with pain and shock, even though there is no paralysis of arms and/or legs, the case should be treated as under:

CLARKE-MOIR TREATMENT

1. Warn the patient not to try to move, even as you are walking towards him.
2. Treat shock. (Important, and not enough stressed).
3. Send immediately for the doctor (message can be sent by any assistant), and if there is any chance of getting a doctor in a short time *do nothing more* (continue shock treatment) till the doctor comes.
4. If there is no chance of getting skilled medical aid in a reasonable time and if you have trained helpers with blankets, triangular bandages, and stretcher, proceed as under:

(*a*) If the patient is found in any position other than on his back, with great care and all the assistance possible, turn him gently on his back.

(*b*) Tie the lower limbs together with broad triangular bandage, figure of "8" around the ankles and feet, the lower limbs with broad triangular bandages around the knees and thighs.

(*c*) Five broad bandages (triangular) are then passed under the natural hollows of the body so they lie under the head, chest, hips, thighs and calves.

(*d*) Two strong poles are used and the bandages are looped around or tied to the patient who is then gently and slowly lifted on to the stretcher by two or more assistants on each side.

(*e*) The stretcher, which should be hard and flat, is prepared by blanketing, Army Method of Wanstead (4 folds under and 2 over) with a small pad or cushion (folded garment or coat) placed on the stretcher behind the cervical or lumbar regions.

This method incorporates the teaching of Professor Platt and Mr. C. Clarke. It should be welcomed by teachers and students of first aid and even orthopædic surgeons. The publication of the Clarke-Moir method aroused some controversy which appeared in numerous letters in the *British Medical Journal*. Dr. J. L. McKenzie Brown wrote Lt.-Col. Moir that the lower limbs should be tied before the patient is turned on his back. Lt.-Col. Moir quite agreed with this suggestion and it appears in that order in this description of the Clarke-Moir method.

Desmond Mulvany criticized the method in the *British Medical Journal* of December 5th as follows: He regretted the tendency to instruct first aiders to carry cases of fractured spine in the supine position. "There was no doubt", he said, "that such cases, if carefully handled, could be safely carried in this position, but it would require expert handling on every occasion by skilled first aiders." He doubted if this skilled assistance was always present, and even if it was he doubted that the facilities and time would also be available (*e.g.* in air raids) to secure that the natural contour of the spine be rigidly maintained so that no flexion movements of any kind could take place. His own experience was that there was no time available to attend to small details of this sort and that consequently irreparable damage could be done by injudicious handling. He suggested that the first aider be instructed to carry the patient in that position which would cause the least damage, namely the prone position. The whole value of this method lies in the fact that the dangerous method of flexion is guarded against during transport. This danger is always present and its tendency to occur can be best appreciated if all the necessary movements of a patient's body on removing him from a demolished building are considered. It is these manipulations that may have a serious consequence unless transportation be carried out in the prone position.

As to the difficulty in diagnosis, the main duty of the first aider is to treat the most serious condition resulting from the accident first (hæmorrhage). In most cases the patient, if conscious, will inform the first aider as to the site of his pain and if this should be anywhere along the spinal column no further investigation should be needed and the patient should be turned into the prone position. (Apart from the advantages claimed above there will be considerable relief from pain and more comfort from the change of position). Dr. Mulvany cites some cases which should be transported in the supine position. Cases of fracture of the cervical vertebræ are better carried on their backs. This is true, but there is still little difficulty for the first aider as regards diagnosis because these cases fall into two groups: firstly, fracture-dislocation where the patient is usually unconscious and beyond treatment; secondly, subluxation, where the main complaint is pain in the neck and limitation of movement. In the latter case the first aider should have no difficulty in instructing the patient to lie flat on his back with a small pillow in the nape of his neck.

The *British Medical Journal* has published the particulars of still another first aid measure for fractured spine. This was contributed by Dr. Bowman Edgar, M.O. 4th Bn. Dumfrieshire H.G. A general summary only of his procedure is given below. He states that he is a general practitioner in a busy colliery village with an excellent first aid personnel, and his question to the experts is "Why is it necessary to turn such patients at all, why not bandage them up as they lie?" The nearest hospital to his colliery is thirty miles away and since it has its share of accidents transportation is obviously a serious problem and calls for fairly efficient first aid following an accident. The following is their method of dealing with cases of fracture or suspected fracture of the spine carried out by the colliery team under Mr. Robert McCormick. He states that so far there have been no complaints, but many compliments, and has written it up under the name — Kirkconnell method. The method is described under various headings.

Personnel.—Four first aiders, numbered 1-2-3-4.

Material.—One strong rug or blanket, 2 splints to extend from head to feet, 2 splints to extend from armpits to feet, 1 rug to make a pad between the legs, 7 triangular bandages and one short splint to pass the bandages.

Procedure.—Bearers 1 and 3 to the sides of the patient. No. 4 goes to the head and No. 2 to the feet. The rug is pleated up from top to bottom and is placed at the patient's head. Nos. 2 and 4 apply extension and counter-extension while Nos. 1 and 3 pull down under the injured man in the following manner: Placing their inner hands against the patient's side, they grasp the outer edge of the rug with the outer hand and pull downward and outward, thus preventing the edges of the rug curling up as it is pulled down and so maintaining a minimum thickness between the patient and the ground. Pulling the rug down is done as follows: The first pull gets the rug to the waist and by successive tugs the rug is brought down into the hollow, the upper edge of the rug remains at the level of the head. By a similar movement it is pulled into the hollow below the buttocks and in successive stages to the feet. The rug is now straightened out and turned over the patient while bandages are passed as follows: Under the neck, armpits, upper chest, lower ribs, hips above the knees and under the ankles. The covering rug is again spread out on the floor and the folded pad, made with No. 2 rug, is placed between the legs. It should reach from the crotch to the feet.

Splinting.—The two short splints are now placed on each side of the rug, the top level with the head. They are then rolled inwards in the rug and traction is exerted on them till they come tight up against the patient's body with the part under his back perfectly taut. Bearer 1, standing at the head, grasps the rolled in splints at the level of the shoulders. No. 3 astride over the patient grips opposite the hips and No. 2 grasps the rolled-up rug at the ankles. All lifting carefully together, the patient is raised a couple of inches from the ground, just enough to allow the two long splints to be slipped under the patient on top of the bandages so as to lie along either side of the spinal column. The patient is carefully eased back to the ground and the short splints are rolled out of the rug and re-rolled in it so that their upper ends are now at the level of the axilla. In tying the bandages, starting at the top, the first and second are tied to each other close to the seams of the jacket and the long ends tied over the chest in the middle line. The remaining bandages are tied firmly in the middle line except at the ankles which is tied in a figure "8".

Loading.—Loading on to the stretcher is done by the same lift as was used to pass the long posterior splints. For a long journey the back splints may be padded with rugs, folded lengthwise, and the side splints can be padded with tow, etc., if desired. Pads of wool may be placed under the bandages on the chest to prevent friction. For the prone position a similar procedure may be adopted, the splints being placed either down the back or under the abdomen. Owing to the absence of natural hollows when lying prone, a modified method of rug passing will be used. A pull of 6" only is made from the head and then by a series of 6" waves, the rug is passed to the feet. This assures that there is only a small area of folded rug under the patient at any one time. This method can also be used for supine patients whose "natural hollows" are not much in evidence.

Cervical fractures.—In these cases the following additional equipment is required: 2 bandages, 2 short splints, and 2 large pads. The same procedure is used as for the trunk (thoracic, dorsal and lumbar) but the extra bandages are placed under the head and neck. The two pads are used to steady the head and are supported by the short splints, which, in the final roll-in, are used from the shoulder to the top of the head.

The final result obtained by this method is: (*a*) The patient runs no risk of further damages by being moved unnecessarily. (*b*) He is comfortably enclosed in an "orange-bob" which allows of safe and easy transport. (*c*) He can, on arrival at the hospital, be placed, if desired, directly on the x-ray table, the back splints can be slipped out and he can be safely handled for removal to bed after radiograms have been taken.

Dr. Edgar concludes by saying that the technique is very much easier to carry out than to describe. Theoretically, it may be all wrong; in practice it gives good results.

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PROCEDURES RECOMMENDED FOR THE ORGANIZATION AND OPERATION OF A BLOOD BANK*

Part II.—Procedures

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PREPARATION OF EQUIPMENT AND SOLUTIONS

Cleaning of equipment. — The majority of febrile reactions from the intravenous administration of blood and other fluids are traceable to faulty cleaning and inadequate sterilization of apparatus, or to pyrogenic impurities in the solutions. Too much emphasis cannot be placed on the importance of having a trained person who can give full time to the supervision of these details. A routine, such as described below, should be posted in the laboratory and should be rigidly followed.

Used equipment should be cleaned as soon as possible. The cleaning may be facilitated if the persons who use the apparatus can be induced to rinse it in cold water immediately afterwards.

* Part I appeared in the May, 1944, issue.

† The untimely death of Dr. L. J. Rhea was announced shortly before the publication of this paper.

In the laboratory, the first prerequisite in the cleaning operation is to dismantle completely the apparatus so that the glass and the rubber parts can be treated separately.

1. *Glassware.*—(1) Rinse glass parts in cold or lukewarm water and remove adhering solid materials. Hot water will coagulate blood and plasma.

(2) Transfer the glassware to a bath of mildly alkaline cleaning solution, such as a 5% solution of soda, or better still, the newer cleaning materials, *e.g.*, trisodium phosphate* (2 to 5%), Calgon† or Pensalt.‡ Raise the temperature to about 60° C. (140° F.) and maintain for 20 minutes. Allow the solution to cool sufficiently for handling the apparatus.

(3) Rinse the equipment in running hot water for 20 minutes, treating the pieces individually at the last to ensure complete removal of the cleaning solution from the inner surfaces.

(4) Rinse the articles individually several times with freshly distilled water.

2. *Needles and stainers.*—(1) The individual needles, after a preliminary rinsing in cold water, should be placed in a shallow pan containing water made mildly alkaline with soda. Care should be taken not to blunt the needle points.

(2) The hub should be freed of blood or other solid matter by inserting an applicator or match with a small cotton swab in the end moistened with ether. The stem then may be cleared with a close-fitting stilette. Immersion of the needles in a weak (1 to 3%) solution of hydrogen peroxide, or in fairly strong alkali, for about 10 minutes, is effective in releasing blood, or other solid material, that may not be removed by the previous mechanical treatment. If necessary, the needles may be treated with hot, mildly alkaline solution.

(3) The needles individually should then be thoroughly rinsed successively with hot water, distilled water, and finally with saline or with alcohol and ether. Rinsings may be done either by means of rubber tubes connected with the water supply, or more conveniently by using a water suction pump.

(4) The needles should be protected by a suitable means, *e.g.*, by standing them, hub down, in holes in a wooden block.

(5) Needles should be thoroughly cleaned before and after being sharpened. If they have been in contact with oil or grease during sharpening, they should be flushed first with ether and then washed with hot alkaline cleaning fluid.

(6) Stainless steel strainers should be cleaned in concentrated nitric acid (hot), concentrated ammonia water, or boiling alkaline cleaning fluid, and then be rinsed thoroughly with hot water and finally with distilled water.

3. *New rubber articles.*—(1) All new rubber goods, such as stoppers and tubing, should be "detoxicated" with a hot alkaline solution such as referred to in the previous section. This treatment removes sulphur, talc and soluble substances which are liable to cause reactions. Tubing should be coiled in a basin and should be submerged and completely filled with the solution, using a funnel, or by applying suction to one end. The solution then should be boiled for 15 minutes, or better still, autoclaved.

(2) Decant the alkaline solution and remove the contents of the tubing by draining or by suction. Rinse the articles with several changes of hot water by filling the basin and decanting rather than by allowing hot water to run continuously from a faucet. About 5 minutes should be allowed between each washing, and the materials should be agitated several times in the meantime. A final rinsing with distilled water is sufficient in the case of rubber stoppers.

(3) The interior of the rubber tubing requires additional rinsing. If the tubing is in short lengths, they may be united with small pieces of clean glass tubing. It is convenient to carry the latter through the cleaning treatment along with the rubber tubing. The hands should be washed before connecting the units. Hot water should then be drawn or forced through the train of tubing for 20 minutes.

(4) Finally, rinse with a liberal quantity of freshly distilled water followed by physiological saline.

(5) Permit the excess fluid to drain from the tubing.

4. *Used rubber articles.*—(1) An initial rinsing and washing with cold water should be given to remove blood and other material. Clotted blood may be removed from rubber tubing by using a 22-calibre rifle ramrod or a small stiff coiled spring about 4 mm. in diameter, such as is used for cleaning sinks. Pressing and rolling the tubing on the table with a flat

* Mallinckrodt technical grade is satisfactory.
† Obtainable from Fisher Scientific Co.
‡ Obtainable from Canadian Industries Limited.

piece of wood, or stretching it, while running water through it, also will release the clots. Cold water should then be drawn, syphoned, or forced through the tubing for 20 minutes. *This treatment alone is not sufficient even though the articles may appear to be clean.*

(2) The tubing or other articles should be treated with hot alkaline solution as described in the previous section. This is absolutely necessary to ensure complete removal of organic material which might support the growth of bacteria. Omission of this treatment, because the articles appear to be clean, is one of the commonest causes of reactions. Cleansing of soiled tubing with green soap alone is not adequate. The use of soap as the sole detergent for cleaning has been discontinued in the majority of hospitals. If soap is used it must be the most soluble type (*e.g.*, green soap). Ordinary soap will give a precipitate with hard water, and when it alone is used for cleaning the incidence of reactions usually rises.

(3) The final rinsing should be carried out as previously specified. At least 100 c.c. of freshly distilled water should be allowed per unit of tubing. Many authorities recommend a final liberal rinsing with sterile normal saline prior to sterilization.

(4) The apparatus should be assembled, rinsed with distilled water or saline, and sterilized as soon as possible after cleaning to safeguard against the growth of microorganisms and development of pyrogenic substances. Tubing that is not needed at the time should be wrapped and autoclaved before storing.

STERILIZATION

1. *Sterilization with dry heat.* — Glassware and metal articles such as needles (*but not rubber goods*), may be sterilized by heating in an oven at 200° C. for 30 minutes, or at 160° C. for 2 hours. Allowance must be made for the mass of the material and the time required to raise the temperature to the proper degree. Extra time should be given when articles such as pipettes are placed within closed containers. Placing a small moist cotton swab in the containers prior to sterilization will facilitate the transfer of heat.

2. *Sterilization with steam.*—Next to faulty cleaning of equipment the commonest cause of reactions in intravenous therapy is incomplete sterilization. This frequently occurs when the operator of the autoclave has too many additional duties to perform, and when the period of sterilization is reduced, or the autoclave is overloaded, in order to handle a large volume of work. In the operation of the blood-bank any slip in sterilization is reflected immediately in the clinic by a sudden increase in the frequency of reactions. Since blood and plasma are culture media for the growth of microorganisms, a constant check must be kept on the sterility of the equipment used, and on the stored specimens. To ensure proper sterilization the following facts must be appreciated:

(1) Ample time must be allowed for the material in the autoclave to be heated to 120° C. (250° F.), and the entire surface of the materials must then remain in contact with steam for at least 25 minutes. The rate of heating during the initial period depends on the mass of the material, the extent to which the penetration of steam is retarded by the wrappings on the articles and the way the latter are placed in the autoclave.

(2) Steam cannot penetrate the interior spaces of the apparatus unless the air simultaneously is expelled.

(3) Air, being heavier than steam, tends to be expelled downwards. Apparatus should be wrapped loosely and placed in the autoclave in such a way as to facilitate the downward escape of the air. Among the most difficult articles to sterilize are flasks and tubes placed in the upright position. To assist expulsion of air, a small quantity of distilled water should be placed in the flasks, or if possible the flasks should be placed on their sides. Obviously the flasks should never be tightly stoppered. Moistening the inside of plugged tubes or rubber tubing immediately before autoclaving likewise aids sterilization. Gauze, towels and other materials should be wrapped loosely and in not too large bundles. The latter should be stacked in the autoclave in random fashion to facilitate the penetration of steam from all sides. When intravenous needles are protected with test tubes, a few drops of distilled water should be placed in the tubes prior to sterilization.

(4) The first step in commencing a sterilizing run is to expel the air from the autoclave by opening the escape valve at the bottom of the machine permitting steam to flow through the chamber until the thermometer in the escape line indicates a temperature of 120° C. (250° F.). In some autoclaves the air is removed by evacuating the chamber with a steam ejector.

The latter method does not remove the air as completely as the former and is not recommended. To permit the escape of air continuously expelled from the load during autoclaving, the escape valve must be left slightly open during the entire period.

(5) Only the thermometer at the escape valve under the chamber gives a reliable indication of the temperature in the chamber. During sterilization the thermometer should read at least 120 to 125° C. (250° F.). This temperature will not be indicated until practically all the air has been expelled from the chamber. The pressure gauge on the machine indicates only pressure, and should not be used for estimating temperature. The timing of sterilization should not be started until the thermometer in the escape registers the proper temperature.

(6) For light loads of loosely packed material sterilization should be continued for 25 minutes. Empty flasks, placed in the upright position, should be given at least 35 minutes. A still longer period may be required for heavier loads, particularly in large autoclaves. The performance of the autoclave should be thoroughly and frequently checked by means of test papers, preferably with "Steam-Clox" papers which change colour only on exposure to heat in the presence of moisture. The test slips should be placed in the centre of bundles, and at the bottom of one or two control flasks or tubes. If a piece of string is attached to the tags they can be removed without opening the bundles.

(7) If the autoclave has a steam jacket, the material can be dried after sterilization by releasing the pressure and leaving the door of the autoclave slightly opened while the jacket temperature is kept at 120° C. for about 20 minutes. If the machine is not jacketed, the pressure in the chamber should be released fairly slowly, and when the temperature on the upper thermometer reaches 80° C. (116° F.) the door should be opened slightly. Rapid release of the pressure will cause excessive condensation within the chamber. Moist packages must be dried in an oven at about 60° C. If stored in the moist condition the packages should not be considered sterile.

(8) Solutions and apparatus preferably should be sterilized separately. For small volumes of liquid a sterilization period of 20 minutes at 120 ° C. usually is sufficient. When large volumes are to be autoclaved, time should be allowed to bring the temperature up to the proper level. To avoid loss of fluid or volume by sudden ebullition, or by evaporation, at the end of sterilization the pressure in the chamber should be permitted to fall to zero before opening the door.

Needles and other articles should not be sterilized by boiling as this treatment does not kill bacterial spores.

PREPARATION OF SOLUTIONS

1. *Distilled water.*—Water for the preparation of solutions for intravenous use if possible should be used within two hours of the time of distillation. If this cannot be done it should be sterilized immediately by boiling for 10 minutes with the mouth of the vessel covered by an inverted beaker. Distilled water should not be collected in tanks, but in glass containers which have been freshly cleaned and thoroughly rinsed with hot tap water, and finally with three or four lots of water collected directly from the still. The still should be constructed so that there is no chance of spray from the boiling water being carried over into the condenser. If the water to be distilled is high in organic matter, or is suspected of being unduly contaminated, it may be given an initial purification before distillation by heating to boiling, adding about 1 gram of adsorbent charcoal per litre, and filtering after 15 minutes. An alternative method consists in adding a pinch of potassium permanganate and a small amount of sodium carbonate prior to distillation.

2. *Solutions containing salts and dextrose.*—Only the purest grades of chemicals should be used. Solutions containing dextrose along with salts such as sodium chloride, sodium citrate or phosphate, tend to become discoloured during sterilization. The change, is commonly referred to as "caramelization". It is inhibited below pH 5, but becomes increasingly pronounced with increase in pH, especially above pH 7. The resinous material is finely colloidal and imparts a pale to deep yellow colour to the solution, depending on the degree of chemical change. On standing for a few months some of the material may precipitate out as a dark coloured sediment, which on shaking the solution, is readily dispersed again in colloidal form. There is now ample evidence that caramelization, in slight degree, does not impart toxicity to solutions. Several workers have demonstrated that red cells (blood) preserved in caramelized

citrate-dextrose solution show no difference in behaviour, either during storage or after transfusion, from blood preserved in an uncaramelized solution. Nevertheless coloured solutions, particularly if containing a sediment, do not inspire confidence, hence it is more satisfactory to use colourless preparations.

Citrate-dextrose solutions are now available commercially in which the degree of coloration is almost imperceptible. To avoid caramelization it is necessary to sterilize the citrate and dextrose solutions separately, and to mix them aseptically after cooling. A simple arrangement for doing this is illustrated on page 162.

Solutions containing dextrose, citrate and other organic substances are excellent culture media for many microorganisms, and rapidly may become pyrogenic or even toxic if not sterilized immediately after preparation.

3. *Solutions for the preservation of blood.**—The following mixtures, developed in the Department of Biochemistry at McGill University,[40] have been used for some time in four large hospitals in Montreal and also in other centres.

(1) *Isotonic citrate-dextrose.*—Modification of DeGowin's formula[17]). See page 159).

Blood	500 c.c.
Sodium citrate (3.2% solution of dihydric salt)	100 "
Dextrose (5.4% solution C.P. anhydrous)	150 "
	750 "

The proportion of diluent may be reduced, as in the formula below, without seriously impairing red cell preservation, but fibrin precipitation during storage will be accentuated under these conditions.

Blood	400 c.c.
Sodium citrate (3.2%)	60 "
Dextrose (5.4%)	80 "
	540 "

(2) *Phosphate-citrate-dextrose.*

Blood	400 c.c.
Citrate (3.2%)	80 "
Dextrose (5.4%)	80 "
Isotonic sodium phosphate solution pH 7.4	40 "
	600 "

The sodium phosphate mixture is constituted as follows:

Acid sodium phosphate ($NaH_2PO_4H_2O$)	1.75 gm.
Alkaline sodium phosphate ($Na_2HPO_412H_2O$)	32.75 "

Distilled water to make 1,000 c.c. of solution.

Antiseptic agents such as merthiolate, tricresol, and sulfonamides have an adverse effect on the stability of the red cell membrane, hence should not be used in the preservation of whole blood.

* See later for additional preservative solutions which are widely used at the present time (page 159).

COLLECTION OF BLOOD

(1) *Standard apparatus.*—The method used for collecting blood depends on the equipment available and the preference of the individual. Numerous standard types of bottles and equipment are now available from commercial companies, and all are very satisfactory in the hands of the trained worker. For operating a blood and plasma bank standard equipment is more satisfactory than home-made and heterogeneous apparatus. Under some circumstances, however, improvisation may be necessary.

Some makes of standard equipment include evacuated flasks containing citrate, citrate-dextrose or other mixtures. This type of flask has won popularity because it speeds up the collection of blood and greatly reduces the number of failures due to clotting of the blood in the needle and the tubing. The red cells, however, suffer a considerable degree of damage from being exposed suddenly to the greatly reduced pressure in the flask, particularly when excessive foaming occurs. The damage is not serious if the blood is to be used within three weeks. When used properly the advantages of the evacuated flask outweigh the disadvantages.

For optimal preservation of the red cells, blood should be collected by spontaneous flow or with the aid of a rubber suction-bulb. The latter never should be connected directly with the blood-collection flask, as contamination will almost certainly occur from the slight forward puff of air produced when the bulb is compressed. A sterile cotton filter, or a valve, should be placed between the bulb and the flask. It is well to remember that accidents from air embolism have been known to occur when a pressure-bulb instead of a suction bulb was used by mistake. A Bunsen valve consisting of a 2-inch length of rubber tubing with a slit in it (see page 162), placed in the circuit, will safeguard against accidents and contamination by permitting the air to pass only in one direction.

(2) *Improvised apparatus.*—In emergencies, when standard equipment is not available, it may be necessary to use ordinary laboratory flasks, or even milk bottles, for the collection of blood. If two-hole rubber stoppers are available the collecting sets may be assembled as a closed system. All parts should be cleaned as

previously outlined. After placing the appropriate quantity of citrate-dextrose in the flasks, the stoppers, with the tubing attached, should be placed *loosely* in the container, and then covered with gauze tied around the neck. After sterilization the stoppers may be pressed more tightly in place. The purpose of covering the top of the container is to keep the mouth and the outer top of the flask sterile so that later after removing the stopper the blood may be poured aseptically into an infusion funnel.

If stoppers are not available the following modification of the open system will remove many former hazards of contamination.

The flasks, marked at appropriate levels and containing the anti-coagulant, should be covered with a piece of substantial paper such as butter-paper or Kraft paper, tied securely around the neck. In the centre of the mouth of the flask a hole about 5/8 of an inch in diameter should be cut in the paper to admit the bleeding tube. Another piece of paper then should be applied and tied round the neck of the flask. The bleeding tube may consist simply of a piece of rubber tubing about 10 inches in length carrying a number 15 or 16 needle. The set should be wrapped and autoclaved.

When a venipuncture is to be performed, the assistant should remove the outer paper cover from the bottle placing it on a sterile towel so that the under surface remains sterile. The end of the bleeding tube should be inserted through the hole in the remaining paper cover taking care not to touch the tubing within 6 inches of the end. The venipuncture then is performed. When the bleeding is finished the bottle should be covered preferably with a new sterile covering. A third covering should then be applied and tied in place.

When the blood is to be used the cells may be suspended by circular agitation. All the coverings on the flask may then be removed, being careful not to contaminate the mouth of the vessel, and the contents may be decanted into an infusion funnel provided with a strainer consisting of six or eight layers of sterile gauze.

1. *Selection of donors.*—In selecting donors the following is recommended:

(1) Donors should be between 18 and 60 years of age.

(2) Only persons should be accepted who state that they are in good health, and who have not a history of heart disease, tuberculosis, malaria, syphilis or infectious jaundice (within the past six months).

(3) Persons with the following conditions should be excluded: (*a*) polycythæmia; (*b*) acute respiratory infections; (*c*) infectious diseases of the skin; (*d*) hay-fever in the acute stage; (*e*) hæmophilia or other condition indicating deranged clotting of the blood.

(4) Women should not be accepted during pregnancy, and preferably not during, or immediately after, the menstrual period.

(5) If the colour of the mucous membranes suggests the presence of anæmia a hæmoglobin estimation should be done. The average normal hæmoglobin level may be taken as 15.6 grams % for men and 13.8 for women. The normal value for some individuals may be higher, and for others, lower than the above average. To be acceptable the donor must have a hæmoglobin value of not lower than 12.3 grams %.

(6) It is preferable to avoid using donors who, within the previous hour or two, have had a heavy meal, because the plasma invariably contains an excessive amount of fat and other products of digestion.

(7) An amount of 3.5 c.c. per pound body weight may be taken as a guide to the quantity of blood to be taken from the donor. The volume removed at one time should not exceed 500 c.c.

(8) Donors should not give blood more often than once in two months. Individuals who experience prolonged effects after giving blood should donate a smaller amount, and less frequently, than stated above.

2. *Performing the venipuncture.* — There is evidence that contamination of stored blood sometimes arises from failure to cleanse sufficiently the site of venipuncture. This danger is considerable when the donors come to the clinic from work, or when the operator palpates the surface of the arm after the skin has been cleansed. In former times when blood was transfused immediately after being collected, these slips in technique usually were without consequence. Since blood for storage represents a potential culture medium for bacterial growth the utmost precaution must be exercised in its collection and preservation.

The following routine should be observed in the collecting of blood:

(*a*) The donor should be lying down with the arm supported under the elbow so that it is

well extended. The left arm generally is used for venipuncture.

(*b*) For selecting a suitable vein good illumination is important. A tourniquet or an aneroid-sphygmomanometer cuff should be applied well above the elbow. If the veins are not visible usually it is easy to locate one by lightly palpating the surface while the donor clenches his fist. The finger used for palpating should be clean. The site of puncture should be well below the bend of the arm. After selecting the site, the tourniquet should be released.

(*c*) The operator should wash his hands thoroughly and then proceed to cleanse the appropriate area of the donor's arm just below the elbow, with soap and water applied with a clean swab. The area should then be wiped with 70% alcohol. The operator should refrain from touching unsterile articles until the bleeding is under way.

(*d*) With a sterile swab apply tincture of iodine (2½%) liberally over and for several inches around the site to be punctured. The solution should be rubbed well into the crevices of the skin. With another sterile swab containing 70% alcohol the iodine should be removed, *beginning at the centre of the area and working outwards.* Cover the site to be punctured, with a sterile gauze "wipe".

(*e*) If the operator prefers to use a local anæsthetic, an injection of about *2 drops* of procaine (0.5 to 2% solution) should be injected *intradermally* at site to be punctured and then be pressed lightly with a sterile swab, leaving the latter in place until ready to insert the needle. Injection of more than 2 drops is unnecessary and usually produces painful distension of the skin. Care should be taken *not* to inject the anæsthetic subcutaneously or into the vein. The operator and assistant, if not wearing masks, should refrain from talking while performing these steps.

(*f*) Apply the tourniquet again just tightly enough to make the veins stand out, or if a sphygmomanometer is used, have the donor keep the pressure between 60 and 80 mm. If he complains of a tingling sensation in his hand, or if his hand is "going to sleep", the tourniquet should be loosened slightly or the pressure reduced to 30 or 40 mm.

(*g*) Insert the needle (number 15 or 16 preferably with not too long a bevel) under the skin at the site of anæsthesia and push it forward 2 or 3 mm. before entering the vein. This procedure ensures a more horizontal entry into the vein and safeguards against transfixing it. If it is necessary to palpate before or after inserting the needle, the finger tips should be moistened with tincture of iodine, and palpation should be done away from the puncture. If the vein tends to shift during the attempt at puncture, it may be steadied by placing the thumb and index finger (after cleaning) astride it and lightly stretching the skin. Not more than two attempts should be made to enter the vein. Failure on the first attempt usually causes damage to the tissues, and the tissue fluid entering the needle almost always causes clotting even when the second attempt is successful.

(*h*) After bleeding has begun place a small roll of bandage in the donor's hand and have him alternately close the hand slowly and firmly, and open it, about every five seconds to help the flow of blood.

(*i*) If the evacuated type of bottle is used, it should be held in the inverted position during the collection of blood so as to permit the blood to flow directly into the preservative. The mixture should not be agitated strongly during the bleeding as this will give rise to foaming under the reduced pressure, and invariably will cause early hæmolysis and excessive precipitation of fibrin during storage. The bottle rather should be given a gentle rocking motion. If the bottle is not the evacuated type it should be held upright so that the blood will fall into the solution without running down the wall of the container. To ensure this it is necessary that the inlet tube project well beyond the stopper. The mixture should be swirled slowly and continuously to ensure immediate inhibition of the clotting process. The bottles should be agitated gently for a minute or so after the blood has been taken.

3. *Collection of auxiliary blood samples.*—A small rack containing the following small sterile and stoppered test tubes (100 x 12 mm. tubes of about 8 c.c. capacity) should be on hand.

(*a*) One empty tube for the serological test for syphilis.

(*b*) One or two tubes half filled with the preservative mixture or physiological saline solution for making the light cell suspension for major matching. The former solution is preferable as it gives better preservation of the red cells during storage.

(*c*) Two tubes, either empty or about one-quarter filled with the same preservative mixture as in the main flask, depending on whether the samples are to be permitted to clot or not. (See below). These specimens provide serum or plasma for minor matching.

When the desired quantity of blood has been taken into the main bottle, the auxiliary blood specimens may be collected as follows, leaving the needle in the vein:

Withdraw the needle from the stopper in the blood-collection bottle.

Collect about 5 c.c. of blood in tube "*a*" (about 2/3 filled). This specimen will clot.

Collect 1 drop of blood into each of the tubes "*b*".

Fill tubes "*c*" about three-quarters with blood. Stopper and invert them immediately if they contain the preservative solution. The disadvantage in omitting the latter and allowing the blood to clot is that the red cells begin to hæmolyze after a few days thus necessitating the transfer of the serum to other tubes. If, on the other hand, the blood is collected into the preservative the red cells will remain intact for weeks. The preservative will reduce slightly the titre of agglutinins in the plasma, but when used in the proportion specified it will not interfere seriously with the minor matching.

When the auxiliary or "pilot" samples have been taken, release the tourniquet, or the pressure, and place a sterile swab over the puncture. Withdraw the needle from the vein with a fairly rapid horizontal movement. Apply light pressure to the swab over the puncture for a minute or two, and then a bandage.

Label the pilot specimens at once and attach tubes "*b*" and "*c*" to the main blood bottle with a strip of adhesive or a rubber band.

Some operators prefer to collect the auxiliary samples by draining the tubing. When this is done the tube should be clamped near the blood bottle before withdrawing the needle from the vein. The contents of the tubing then may be dispensed into the test tubes either by stripping the tubing with the thumb and index finger, or by removing the needle from the stopper of the blood bottle and allowing the contents of the tube to drain into the test tubes. This procedure must be carried out promptly to avoid clotting of the blood in the tubing.

It is important that all the pilot samples be sterile since infected cell suspensions and serum may produce pan-agglutination in subsequent tests.

4. *Labelling of samples and keeping of records.*—Information concerning the blood samples should be recorded without delay so as to avoid errors.

For easy identification of the samples in the bank according to the blood groups, the use of coloured tags is advocated, the colour indicating the group. The following colour code is recommended:

Group A — Blue*
Group B — Green*
Group AB — Yellow
Group O — Red

On the label of each bottle should be recorded the serial number of the specimen, the date, the donor's full name, the blood group and type, and any other information that may be of value. The name of the donor should be printed in full, since not infrequently one meets with individuals with the same name and initials.

For the pilot tubes, small adhesive labels, long enough to go round the tube and overlap, are recommended. On each label should be printed the donor's name, the serial number of the specimen and the blood group.

When the serological test for syphilis is reported negative, the designation "negative" should be written on the coloured tag to show that the specimen has been duly examined. If the test is positive, the blood should be discarded.

Information concerning positive serological tests should be kept strictly confidential. The records should be kept in locked files and should be available only to the medical director of the blood bank. The donor privately should be advised to consult his physician, and to request that an independent serological test be made. A complete record should be kept of donors and their blood groups, the recipients or disposal of the blood, and the stock and turnover of the bank. A description of filing systems for hospital blood banks may be found in some of the more recent publications on the subject.[4, 18] It is valuable to keep a record of Rh-negative donors.

5. *Reactions during and after blood donation.*—Syncope, during and following blood donation, is not uncommon. This type of reaction

* These colours must be true blue and green so as not to be confused.

is transitory and is quite harmless to the donor. Systematic studies on the problem[5, 19, 20] indicate that syncope is largely a vaso-vagal or other nervous reaction. The psychological factor of apprehension is a common initiating cause of fainting in new donors. When several donors are being bled in one room at the same time, one fainting may cause an epidemic. Fainting may occur even in experienced donors. The initiating cause in these cases is obscure and probably is related to fatigue or to a lowered vitality. There appears to be no good correlation between fainting and factors such as lowered blood sugar from fasting previous to donating blood, anæmia, slightly lowered blood volume or blood pressure, low fluid reserves, heat and humidity. That is, none of these is a consistent or dominant cause. An extreme change in the weather, such as a rapid onset of hot weather, usually is accompanied by an increased incidence of fainting. It has been the experience in numerous blood-collection clinics that a drink of water, tea or fruit juice before giving blood, reduces the incidence of fainting.

The convulsive (tetanic) type of reaction is believed to be caused by hyperventilation due chiefly to fear. While stimulants may be indicated at times, usually it is sufficient to have the donor hold his breath, or breathe into a bag so as to promote retention of carbon dioxide.

The use of the sphygmomanometer instead of a tourniquet, and having the donor operate it, affords a means of distracting his attention during the bleeding. Repeated reassurance on the part of the person attending the donor often is more annoying than helpful. Fainting after leaving the cot usually is prevented if the donor remains lying down for about 15 minutes. Elevating the feet by raising the bed, or by other means, is helpful in preventing syncope if the subject feels faint. If these symptoms come on after he has left the bed, he should be seated and bend forward so as to lower the head.

PREPARATION OF STORED BLOOD SAMPLES FOR TRANSFUSION

Failure to resuspend the red cells in the proper manner at the time of transfusion is one of the most common causes of mechanical difficulties in the administration of preserved blood. Thorough dispersion of the sedimented red cells requires patience and careful handling. If incompletely dispersed, the cell aggregates clog the strainer and arrest the flow. When this occurs, no amount of agitation will remedy the situation. Very often, clogging of the strainer is attributed to fibrin, when actually it is caused by incompletely suspended cells.

Blood stored in squat-type bottles should be mixed by slowly swirling the contents for five minutes, or longer if any visible dark patches of sedimented cells remain on the bottom of the bottle. If stored in centrifuge bottles, it must be mixed by slowly and repeatedly inverting the bottles. The cells never should be dispersed by shaking, since this treatment may result in extensive traumatization and hæmolysis.

Preserved blood after being mixed should be administration without further warming.

PREPARATION OF POOLED PLASMA

Equipment. — Several brands of standard equipment are available, which make possible the removal of plasma by the closed method, *i.e.*, without exposing it to the air of the room. Even with this system, it is necessary to remove every risk of contamination. If possible, a special room, or cubicle, should be reserved for the work. Windows should be closed and fans should not be used to circulate the air. Incoming air should be filtered, preferably through a baffle (see page 165) consisting of six sheets of cotton placed about three inches apart and saturated with light mineral oil. For a small room, sheets about 2 ft. by 2 ft. are a satisfactory size. A vent may be placed at the top of the room. The cubicle should be gone over with an oiled cloth a couple of hours before being used. As an extra precaution the bench may be covered with damp towels to provide a dust-free surface while the work is in progress. A Bunsen burner should be provided for flaming and for maintenance of an updraught to prevent dust from settling. Only scrupulous persons, with a training in bacteriological technique, are qualified to handle blood and plasma. The workers should wear masks. All supplies should be in the room at the start to avoid walking about while the work is in progress.

Some standard types of blood-collection equipment include bottles of 300 and 500 c.c. capacity which fit the standard centrifuge cups. This makes possible accelerated sedimentation of the red cells when plasma is required in a hurry, and also increases the yield. The bottles are provided with perforated rubber stoppers to permit all operations to be done by the closed method.

Aspiration for drawing off and pooling the plasma may be produced with any of the following devices: (1) standard evacuated blood-collection bottles; (2) water pump; (3) rubber suction bulb, or (4) water syphon as illustrated in Fig. 5. With any of the last three devices a sterile filter should be placed between the plasma bottle and the source of suction.

Pooling of plasma.—If the blood is collected chiefly for the preparation of plasma, the red cells may be thrown down by centrifuging the samples at 2,500 r.p.m. for 30 minutes. The tops of the bottles should be covered with paper to protect against dust during centrifugation. If the red cells are to be salvaged for use in the clinic after removal of the plasma, it is advisable to use more moderate centrifugation, *e.g.*, 2,000 r.p.m. for 20 minutes. A slightly longer period may be necessary for blood collected in phosphate-buffered preservative, since sedimentation of the cells is somewhat slower in this mixture.

In the case of stored blood, the cells usually settle out fairly completely in the course of a week or so. The plasma may be removed at any time up to thirty or forty days, that is, before extensive hæmolysis has occured. The procedure recommended for the hospital blood bank, however, is to remove the plasma during the third week of storage if the blood is preserved in any of the mixtures described in this report (pages 148 and 159), or during the first week in the case of blood stored in citrate alone.

For the removal and pooling of plasma the procedures recommended by the makers of the equipment should be followed. A description of the closed method is given in a later section of this report and in numerous publications.[3, 4, 5, 14, 21 to 30]

The greatest risk of contamination during the pooling of plasma lies in the use of one needle or glass tube for drawing the plasma from several bottles of blood. If possible, a separate needle should be used for each bottle. Before forcing the steel needle through the rubber stopper of the blood bottles, the stoppers should be sterilized by applying tincture of iodine, removing the excess with a sterile swab. If there is any delay in changing from one bottle to the next the aspirating needle should be protected by inserting it into a large sterile test tube lying on a sterile towel. If a water pump is used, the suction should be discontinued while the next bottle is being prepared. The suction may be easily controlled by means of a foot pedal attached to a spring clamp on the suction line, the suction being applied by pressing on the pedal and releasing the clamp. (See Fig. 5).

Bottles of one or two-litre capacity are satisfactory for pooling plasma. These pools represent the plasma from four to eight individual blood donations. Special precaution should be taken to keep the mouth and outer neck of the bottle sterile by covering with paper, gauze, or gauze saturated with 5% tricresol.

A sterility test should be carried out on each pool before dispensing the latter into smaller lots. It is advisable to permit the pools to stand at room temperature or at 15° C. for 3 to 5 days before doing the tests, so that bacterial growth may occur in lightly infected specimens and be more readily detected. The sterile pools may be dispensed into 250 or 500 c.c. containers for storage.

The practice of adding merthiolate (1:10,000), or other bacteriostatic agents, to plasma has been discontinued in many laboratories.

Storage.—Plasma may be stored in the liquid, frozen or desiccated state. If liquid it may be kept at room temperature, but storage at 15° C. is recommended. At lower temperatures down to zero, fibrin tends to precipitate out. This change in no way impairs the quality of the plasma, but may give rise to difficulty in straining the material during its administration. The addition of dextrose reduces the tendency of fibrinogen to become altered. Obviously, if plasma is to be stored under these conditions it must be thoroughly tested for sterility.

If facilities are available for the rapid freezing of the plasma and for storage at low temperatures (–20° C., –2° F.), the freezing method is the most satisfactory, since prothrombin, complement and fibrinogen remain in better preservation under these conditions. When the plasma is to be used, it must be thawed rapidly by placing the bottles in a water bath at 37° C. (not warmer), and agitating them gently at frequent intervals until the contents are completely liquefied, and the temperature is brought to about 25° C.

Special equipment is required for drying plasma. If the material is to be desiccated dextrose should not be included in the anticoagulant. Dried plasma, as far as is known, will keep indefinitely at ordinary temperatures. It may be reconstituted by the addition of

sterile distilled water, or as Strumia has advocated, with 0.1% citric acid.

For more detailed and illustrated descriptions of the technique of storing plasma and preparing it for administration, the reader may refer to numerous recent publications.[4, 5, 27, 30, 31] Detailed instructions are supplied also by the makers of standard equipment.

A record should be kept of the plasma pools, including the names of the donors, dates of donation, blood groups, date of pooling and initials of the operator, date and result of sterility tests, name of recipient and date of use, and the results obtained.

Limits of storage.—Apart from the tendency of fibrinogen gradually to come out of solution, the changes in plasma during storage in the cold are extremely slow. Fibrin precipitation does not detract from the therapeutic value of the "plasma", but it gives rise to mechanical difficulties by clogging the strainers on the infusion sets. In the experience of one of the authors (G.J.E.v.D.) pooled plasma, after storage for more than two years in the cold, was filtered aseptically and used in the clinic with good results and without incident.

How long plasma may be kept and still be fit for use depends on the conditions of storage and whether the material has been subjected to transportation and rough handling. In the ordinary blood bank, where the material is stored in the cold immediately after preparation, it will remain satisfactory in the liquid state for at least 2 years and much longer if kept frozen.

The following specifications concerning the storage limits for plasma have been drawn up by the U.S. National Institute of Health and the U.S.P. XII:[30]

Liquid plasma stored between 15° C. and 30° C.—1 year.
Plasma kept frozen at below minus 18° C.—3 years.
Desiccated plasma.—Not longer than 5 years.

Utilization of red cells after removal of plasma.—In the larger blood banks, where much of the blood is used for the preparation of plasma, it is becoming the practice to dilute the red-cell residues from group-O bloods, with saline or other diluent, and to use them for transfusion into anæmic patients when the main requirement is red cells. When red cells are to be salvaged for this purpose the plasma should be removed as soon as possible after the blood is collected. The cell residues may either be diluted at once or stored up to two weeks and diluted when required. The cells go into suspension more readily, and are more stable, if centrifugation of the original samples has not been too rapid or prolonged and if some of the plasma has been left behind. If not used immediately, the diluted samples should be stored at 6° C.

Physiological sodium chloride solution is commonly used as diluent, but is not very satisfactory since the cells undergo relatively rapid deterioration, and usually show visible hæmolysis after the third or fourth day. Preservation of the cells is better in citrate-dextrose mixtures, and best in Muether's phosphate-buffered citrate dextrose (see page 159). When stored at 6° C. in Muether's mixture the cells remain stable and viable for three weeks or longer. Isotonic dextrose alone also is an effective preservative, but the red cells tend to stick to one another and some of them become unstable when mixed with normal saline or plasma. The addition of diluent to the cell residues should be done by the closed method, and the specimens should be used as soon as possible.

In reclaiming the red-cell residues the following instructions should be observed:

1. Preliminary to removing the plasma the stopper of the bottle, if of the perforable type, should be sterilized with tincture of iodine, the excess being removed with a sterile swab moistened with 70% alcohol. The top surface then should be protected with the alcohol swab until the stopper is to be perforated.

2. When aspirating the plasma, the air entering the flask should be filtered. A separate sterile needle and air filter should be used for each bottle. The rubber tube through which the plasma is aspirated into the pooling bottle may be connected by means of a Y-tube with a reservoir containing the diluting fluid. After removal of the plasma, and with a suitable adjustment of clamps, the diluent may be added to the cell residue.

3. A separate elongated steel needle, or glass tube, should be provided for each blood bottle and should be wrapped in such a way that it can be inserted through the stopper of the bottle without coming into direct contact with the hands. The rubber tube through which the plasma is to be drawn should be provided with a glass adapter which snugly fits the steel needles and which is protected so that it can be transferred from one bottle to another without danger of contaminating the end. A wrapping

should be applied over the hub of the needle to filter air that enters if the adapter and the hub do not fit tightly.

4. After removing the glass adapter, the end of the steel needle should be covered with a sterile swab while the red cells are being suspended by gentle swirling of the flask. A sterile syringe then may be inserted into the hub of the needle and a sample of the cell suspension withdrawn for grouping and other tests.

5. If the cell suspension is not required immediately, the needles should be removed from the stopper and the latter should be covered with several layers of sterile gauze, and a final covering of paper tied round the neck of the flask.

6. Cell suspensions which lose their bright red colour, or which show hæmolysis during storage, may be contaminated and therefore should be discarded.

7. A complete record should be kept of the blood from which the cells are obtained, the name of the recipient, date of administration, and results.

TESTING OF BLOOD, PLASMA OR SERUM FOR STERILITY

Sterility test.—In the hospital blood bank it is not practicable to do a sterility test on every lot of blood taken for storage. Many of the samples are used before a test can be completed. Furthermore, it is difficult to detect light contamination because of the bacteriostatic properties of fresh unhæmolyzed blood. When starting a blood bank or training new personnel sterility tests should be done on all samples until the technique is well substantiated. If adequate attention is given to the cleansing of the donor's arm, and if a closed system is used for collecting the blood, there is little danger of contamination.

The preparation of plasma or serum, on the contrary, involves more handling and is open to greater risk of contamination. A complete sterility test should be carried out on every pool. Serum offers the advantage over plasma that it can be subjected to Seitz filtration to ensure sterility immediately it is pooled. The material in any case should be kept at room temperature for three days, before testing, to permit bacterial growth to occur in lightly infected lots, thus ensuring detection. Pooled serum should be tested for sterility both before and after filtration.

The tests should be carried out by persons trained in bacteriological techniques.

Test.—For aerobic tests each of four tubes containing 30 c.c. volumes of meat-infusion peptone broth should be inoculated with 5 c.c. of the blood or plasma. After being covered or plugged, two of the tubes should be incubated at 37° C. for 7 days, and two should be kept at room temperature.

Anaerobic cultures may be made by inoculating each of four bottles or tubes containing 20 c.c. of Brewer's thioglycollate medium*[30] with 5 c.c. of the blood or plasma. Two of the stoppered bottles should be incubated at 37° C. for 7 days and two at room temperature.

Gross contamination will usually show up within 48 hours. It is now realized that there are certain organisms, sometimes found in contaminated plasma, which do not grow at 37° C., hence the necessity of performing duplicate tests at room temperature.

Toxicity test.—Plasma or serum may be tested for the presence of toxic substances by injecting two or more mice intraperitoneally with 0.5 c.c. of the material, and observing the animals for a week.

In the operation of the hospital blood-bank, it is not practicable to perform tests for pyrogens.

DETERMINATION OF BLOOD GROUPS

Typing serum.—To ensure accuracy in typing blood the testing serum must be sterile and of adequate strength. Anti-A serum is obtained from group-B blood, and anti-B serum, from group-A blood. As individual bloods may differ considerably with regard to the concentration of agglutinins, it is necessary to determine the titre of the serum to make certain that it is strong enough for typing purposes. This is done by making a series of dilutions—1:2, 1:4, 1:8, 1:16, 1:32, 1:64, and 1:128 or further—in the conventional manner (making each dilution from the preceding one by adding an equal volume of 0.9% saline). The two series of anti-A and anti-B sera then should be tested against light red-cell suspensions (1 drop of blood in 5 c.c. of saline) of two or more group-A and two group-B bloods respectively. In each test 0.1 c.c. of cell suspension should be added to 0.1 c.c. of the serum. Note that this dilutes the serum to half strength. Serum which produces agglutination in at least a dilution 1:64 is suitable for testing purposes. Sometimes the most rapid and pronounced agglutination is obtained, not with the undiluted serum, but with one or two of the intermediate dilutions, *e.g.*,

* Obtainable from Difco Laboratories, Detroit, and Baltimore Biological Laboratories, Baltimore, Md.

1:2. The original serum, therefore, should be made up to the optimal dilution with sterile saline and then should be dispensed into small tubes or vials (1 to 5 c.c.), and stored in the cold, preferably in the frozen state. It is advisable to keep the serum sterile and to omit the addition of antiseptics. If the material is not sterile, tricresol may be added to give a final concentration of 0.5%. If kept sterile, serum may be stored in the refrigerator in the liquid state for many months without deterioration. Contaminated serum may produce panagglutination, that is, it will agglutinate the red cells of all groups, hence is useless. Small bottles or vials provided with eye-dropper stoppers afford a means of dispensing the serum with a minimal risk of contaminating the contents. Frozen serum should be thawed in a constant temperature bath at 37° C., and the containers should be inverted or swirled to mix the contents before using.

Serum from group-O blood with a high titre of both α and β (*i.e.*, anti-A and anti-B) agglutinins may be used along with the other two as an additional check. (See table below).

Sera for differentiating the A subgroups are not readily available at the present time. Subgroups A_1 and A_2 may be differentiated fairly satisfactorily by taking advantage of the circumstance that a higher titre of anti-A agglutinin is required to agglutinate cells of group A_2 than for A_1. Several series of dilutions of the anti-A testing serum may be made, as described in the preceding paragraph. If dilute cell suspensions from a fairly large number of group-A bloods be tested, it will be observed that certain ones (group A_2 or A_2B) show agglutination only in the stronger titres whereas the majority of the specimens (A_1) are clumped even in the weaker titres. By this means one dilution can be selected which will agglutinate only the A_1 cells. The method, while not infallible, may be used to advantage in differentiating the subgroups.

With weak anti-A testing serum, cells of group A_2 may not be agglutinated, hence may easily be mistaken for group O. The anti-A test serum should produce agglutination of A_1 cells in a dilution of at least 1:64, and agglutination of A_2 cells in a dilution of 1:32.

Unless the serum is strong there also is danger of mistaking group A_2B for group B, since the A_2 component of the former usually is weaker still than in group A_2.

It should be borne in mind that serum containing the a_2 agglutinin, will agglutinate cells of group O even more readily than it will cells of group A_2. The occurrence of the a_2 agglutinin, however, is relatively rare.

Certified typing serum for differentiating Rh-positive and Rh-negative bloods can be purchased from various laboratories.*

Methods of blood grouping.—Of the numerous techniques that have been described for determining blood groups the slide or plate method, and the tube or centrifuge method, are the two most commonly used. If the slide technique is employed it is essential that gentle agitation be applied continuously during the test to bring the cells into contact with one another. For this purpose an agitator oscillating not more than ⅛ inch, and at a rate of 4 per second, is satisfactory.

Slide method.

On a microscope slide, or glass plate, draw 2 circles about ⅝ of an inch in diameter with a grease pencil. Mark one "A" for the anti-B serum and the other "B" for the anti-A. As a check some workers use a third circle designated "O" for group O testing serum which contains both the anti-A and anti-B (*i.e.*, the α and β) agglutinins.

Within each circle place 2 drops of the red-cell suspension to be tested (1 drop of blood in 5 c.c. of isotonic saline).

To the first area add 2 drops of A typing serum (*i.e.*, anti-B) and to the second, 2 drops of B typing serum. If a third area is used, add 2 drops of O serum.

Place the slide on the agitator for 15 to 30 minutes. Usually the results of the test are obvious within a minute or two, but a weak reaction may require many minutes.

Examine the slide with the microscope (low power).

The following chart illustrates the reactions of the red cells of the main blood groups with the "A" and "B" typing sera, the + signs indicating agglutination:

	Reaction with typing serum	
	A	*B*
Red cells tested	(*Anti-B or* β)	(*Anti-A or* α)
Group O	–	–
Group A	–	+
Group B	+	–
Group AB	+	+

If a strong group-O serum be used in addition to the above, it should agglutinate the cells of all groups except group O.

The above chart may be summarized by stating that cells which are agglutinated by the anti-A (α) agglutinin must contain the ag-

* Dr. A. S. Wiener, 64 Rutland Road, Brooklyn, N.Y. Blood Transfusion Association, Inc., 2 West 106th St., New York. Certified Blood Donor Service, 146-16 Hillside Ave., Jamaica, N.Y.

glutinogen A, and those which react with anti-B (β) must contain the agglutinogen B.

Instead of a microscope slide a chemical spot-plate, made of clear glass or glazed white porcelain, with rounded depressions, may be used. The plate may be covered with a sheet of glass during the test to prevent evaporation.

Tube method (Landsteiner)

Into each of 2 serological test tubes (75 x 10 mm.) place 2 drops of light red-cell suspension (1 drop of blood in 5 c.c. of saline).

To 1 tube add 3 drops of A typing serum, and to the other, 3 drops of B typing serum. If desired a third tube can be used containing the cells and group-O serum.

Centrifuge the tubes at low speed (about 500 r.p.m.) for 3 minutes.

Remove the tubes and flick them, first very gently, to see whether the mat of cells can be loosened without breaking it, then more sharply to break the mat into fragments.

If the reaction is negative, *i.e.*, if no agglutination has occurred, the red cells will be individually dispersed by this treatment. The persistence of fragments indicates a positive reaction. Negative reactions should always be confirmed by examining a drop of the cell suspension with the microscope.

The tube technique, compared with the slide method, gives more decisive results, particularly when the reaction tends to be weak. It also facilitates detection of hæmolysis that sometimes occurs due to incompletely rinsed glassware, or to fragility of the red cells. The slide method, on the other hand, is more convenient for mass typing, and slides are more easily cleaned than tubes.

Rh-typing

In a serological test tube place 2 drops of light red-cell suspension and 2 drops of anti-Rh serum.

Place the tube in a water bath at 37° C. for 30 minutes.

Centrifuge at low speed (500 r.p.m.) for 3 minutes.

Remove the tube carefully so as not to disturb the sediment, and examine the nature of the margin of the packed cells. If agglutination has occurred the margin usually is diffuse or crinkled, whereas if the reaction is negative, the margin usually is even and clear-cut.

To the experienced observer this preliminary examination may indicate whether agglutination has occurred or not.

Hold the tube at an angle under the microscope (very low power), or under a strong hand lens, and rotate slowly, or flick it very gently to detach the cell mat, or to break it into a few large fragments.

If the mat is released intact, or if it breaks into fragments, agglutination is indicated, that is, the red cells are Rh-positive.

In the absence of agglutination the slightest agitation will disperse the cells as individuals. A drop of the cell suspension, transferred to a slide with a wire loop, should be examined with the microscope.

The reaction between the Rh-factor and its antibody usually is strongest at body temperature. The agglutinated cells, however, are held together very loosely and often are dispersed by careless handling. In this way a positive reaction may escape detection.

For further information on the Rh blood types and their clinical significance the reader is referred to recent publications.[41, 42, 43]

Testing for Anti-Rh. — Anti-Rh agglutinins occur in the plasma (or serum) of Rh-negative individuals as the result of isoimmunization to the Rh-factor. Isoimmunization may take place in some Rh-negative women during pregnancy (see Part I, page 409), and it usually occurs in the later pregnancies.[32] It may occur in Rh-negative male and female individuals in the course of repeated transfusions with Rh-positive blood.

To test a serum for the presence of anti-Rh agglutinin, cell suspensions of several group-O bloods known to be Rh+ and Rh–, are prepared (1 drop of blood in 5 c.c. of saline).

Two drops of cell suspension and 2 drops of the serum are placed in each serological tube, incubated at 37° C. for 1 hour, centrifuged at low speed for 3 minutes, and examined as previously described.

If known Rh-bloods of group O are not available presumptive evidence regarding the presence of the Rh-agglutinin may be obtained by testing at least 10 different group-O bloods against the serum in tubes at 37° C. Approximately 85% of such bloods should be agglutinated if the serum contains an anti-Rh agglutinin. Further support to the reaction's being due to an anti-Rh agglutinin is given if agglutination can be observed only in tests conducted by the tube method and if it does not occur with the slide method. It should be borne in mind that other agglutinins (a_2, anti-M and anti-N) also agglutinate group-O cells.

TESTING BLOODS FOR COMPATIBILITY

Blood should not be used for transfusion without first matching it with the blood of the prospective recipient. Knowing that the donor and the recipient are of the same blood group, or that the donor is a "universal donor", is not sufficient ground for omitting the cross-matching. The latter serves to provide a check on the previous typing and detects the presence of agglutinins formed through isoimmunization. To be acceptable the donor's blood must be compatible with that of the recipient in the major matching, that is, there must be no agglutination when the donor's cells are mixed with the recipient's serum.

Even though it may not be essential, the minor matching (recipient's cells mixed with the donor's serum or plasma) should also be done, since it affords a check when the two bloods are

supposed to be of identical groups. When "universal donor" blood (group O) is used, obviously there will be agglutination in the minor matching. Whether a high titre of reacting agglutinin in the donor's plasma is of any concern is a question still unsettled. It has been demonstrated that large amounts of group-O plasma have been given to individuals of the other blood groups without incident. Apparently the agglutinins are readily diluted out and dissipated in the recipient's circulation. Whether this is true for high-titred plasma, and under all circumstances, has yet to be established.

The α or β agglutinin can be absorbed from serum or plasma by adding Witebsky's A or B substances.*[29, 39]

The technique of cross-matching is practically the same as for blood-typing. Either the slide or the tube method may be used, but for testing Rh-compatibility the tube method must be employed with incubation at 37° C. followed by slow centrifugation.

CROSS MATCHING

Cell specimen for test.—In some laboratories the blood specimens are allowed to clot, and the red-cell suspension is made by teasing cells from the clot after having removed the supernatant serum. It is more satisfactory, however, to collect about 5 c.c. of the donor's blood into 1 c.c. of 3% sodium citrate, and to add 1 or 2 drops of the mixed sample to 5 c.c. of saline for the light cell suspension. This practice ensures a fairly constant concentration of cells in all tests. The recipient's sample may be permitted to clot to provide undiluted serum.

Slide method

A slide or plate with 2 circles, or a spot-plate with depressions, may be used as in blood-typing.

In one area place 2 drops of the donor's light cell suspension and 2 drops of the recipient's serum (major match).

In the other area place the same quantity of recipient's cell suspension and donor's serum (or plasma) (minor match).

Agitate gently for 20 to 30 minutes and examine the slide with the microscope.

Occasionally, pseudo-agglutination occurs in which many of the agglutinated masses suggest rouleaux formation. When this is suspected the test should be repeated using serum diluted 1 in 3 with saline. The repeat test will be negative if the agglutination observed was pseudo-agglutination. On dilution with saline rouleaux usually are dispersed as individual cells whereas truly agglutinated masses remain unchanged.

Tube method

For the ordinary major matching place 2 drops of light donor-cell suspension in a serological tube, and 4 drops of the prospective recipient's serum. The minor matching is carried out similarly with the recipient's cells and the donor's serum (or plasma).

Centrifuge the specimens at low speed for 3 minutes and examine with the microscope.

While the above procedure is satisfactory in most cases, it will not indicate the presence of other factors, *e.g.*, anti-Rh and cold agglutinins. A more complete test may be carried out as follows:

Prepare 3 tubes containing the donor's cells and the recipient's serum, and 3 control tubes containing the recipient's cells and serum.

Pairs of tubes (1 tube from each series) are tested at 37° C., room temperature and in the cold (not below 6° C.), allowing ½ to 1 hour before centrifuging and making the examination.

Remove the tubes from the centrifuge without disturbing the cell sediment, and observe the margin of the mat as previously described (page 157).

The minor matching may be carried out in the ordinary way at room temperature.

By this procedure Rh-agglutination, cold-agglutination and auto-agglutination may be detected. As in blood-grouping the tube method is more rapid and more decisive than the slide method.

Obviously, the firmness of agglutination, *i.e.*, the degree of cell cohesion or "avidity", is not a criterion of degree of incompatibility. Loosely agglutinated cell masses signify as great a potential danger as firm agglutination.

INTERFERING FACTORS IN COMPATIBILITY TESTS

Pseudo-agglutination.—This type of agglutination is characterized by rouleaux formation and is favoured by a high concentration of serum and by evaporation of the solution during the test. It is encountered more frequently in the open slide method than in the tube method.

The test should be repeated using serum diluted 1 in 3 with saline. The repeat test will be negative if the observed agglutination was pseudo-agglutination.

Hæmolysis.—Hæmolysis, during the compatibility test, may be due to the presence of an isohæmolysin in the serum. The isohæmolysins correspond in specificity to the agglutinins normally present in the plasma. When fresh serum (which contains complement) is used in the compatibility test the presence of an isohæmolysin will produce hæmolysis instead of, or in addition to, agglutination. If complement be inactivated by heating the serum to 56° C. for 30 minutes, or by allowing it to stand for 5 to 7 days at room temperature, the hæmolytic activity is abolished.

Hæmolysis, in the compatibility test, has the significance of agglutination. Failure to detect it may lead to the use of an incompatible blood for transfusion.

Hæmolysis may arise also from the use of fragile red cells, *e.g.*, cells that may have been stored under unfavourable conditions, or to improperly cleaned glassware. To rule out these possibilities when hæmolysis

* Obtainable from Eli Lilly Company.

is observed, the test should be repeated with a new cell suspension.

Cold-agglutination and auto-agglutination.—The presence of cold agglutinins in serum may give rise to errors in interpreting the cross-matching tests. Generally the cold agglutinins react at low temperatures, but occasionally they are active at room temperature and sometimes at 37° C. That they are true agglutinins is shown by the fact that they can be absorbed from the serum by adding the appropriate red cells and again separating the serum at refrigerator temperature.

The non-specific variety of cold agglutinin, which is the type most frequently encountered, agglutinates the red cells of all groups hence makes difficult the selection of a compatible blood. These agglutinins clump the red cells of the blood in which they themselves occur, a phenomenon known as auto-agglutination. This occurs in the majority of normal bloods at temperatures approaching zero C., but may occur at ordinary temperatures in patients with hæmolytic anæmias, virus pneumonia and certain liver conditions.

There are also type-specific cold agglutinins which act only on the cells of certain bloods, and do not produce auto-agglutination. The commonest of these are α_1 which acts on cells of Group A_1 and A_1B, and α_2, which reacts with all group-O cells and the majority of group A_2 cells. These agglutinins usually react also at ordinary temperatures.

If agglutination persists at 37° C. the non-specific agglutinins may be removed if a citrated specimen of the patient's blood be cooled to about 2° C. and centrifuged surrounded by ice-water. After separating the red cells (which now have absorbed the cold- or auto-agglutinin), the plasma may be used for major-matching.

Contaminated specimens.—Blood collected without aseptic precautions and kept for a few days is unsatisfactory for cross-matching both with regard to the serum (or plasma) and the cells. The serum, if infected, may agglutinate the cells of all blood groups as well as produce auto-agglutination (Thomsen effect or pan-agglutination). Sterile, and preferably fresh, blood therefore should be used.

SOURCES OF ERROR IN GROUPING AND CROSS-MATCHING

False negative reactions.—These may be due to the following:

(1) The use of weak testing serum.
(2) The use of a too concentrated cell suspension, resulting in absorption of the agglutinins without agglutination.
(3) Failure to allow sufficient time for the test, particularly when constant agitation is not used.
(4) The presence of an isohæmolysin or other hæmolytic agent.
(5) Agglutinogens of low sensitivity, *e.g.*, the A_2 and Rh factors.
(6) Preserved red cells, which tend to react more weakly with ageing.
(7) Technical and clerical errors, *e.g.*, failure to add the test serum, failure to have a definite system when several tests are being done at the same time, failure to label samples promptly, mistakes in labelling, etc.

False positive reactions.—These may arise from the following conditions:

(1) Pseudo-agglutination.
(2) Cold agglutination.
(3) Contaminated serum.

For a more extensive discussion of the subject of typing and cross-matching the reader is referred to various recent publications.[2, 3, 4, 5, 13, 30, 33]

APPENDIX

PRESERVATIVE SOLUTIONS FOR WHOLE BLOOD

In addition to the preservative solutions already described, the following mixtures have been used clinically with excellent satisfaction, for the past four or five years:

1. DeGowin's formula[17]

Blood	500 c.c.
Citrate (3.2%)	100 c.c.
Dextrose (5.4%)	650 c.c.
	1,250 c.c.

*2. Formula of Alsever and Ainslie**[21]

Blood	500 c.c.
Sodium citrate 2.88 grams Sodium chloride 2.09 grams Dextrose 9.33 grams } in	500 c.c. solution
	1,000 c.c.

3. Army Transfusion Service of Great Britain[31]

Blood	440 c.c.
Sodium citrate (3%)	100 c.c.
Dextrose (5%)	40 c.c.
	580 c.c.

4. Formula of the Medical Research Council of Great Britain[35]

Blood	420 c.c.
Sodium citrate (3%)	100 c.c.
Dextrose (15%)	20 c.c.
	540 c.c.

5. Muether's formula†[34]

Blood	400 c.c.
Sodium citrate 2.5 grams Dextrose 28.0 grams Monobasic sodium phosphate 0.6198 gm. Dibasic sodium phosphate 1.0296 gm. } in	600 c.c. solution
	1,000 c.c.

6. Formula of Loutit, Mollison and Young[36]

Blood	430 c.c.
Disodium citrate (3% solution)	100 c.c.
Dextrose (30%)	10 c.c.
	540 c.c.

The disodium citrate may be approximated by mixing 3 parts of trisodium citrate with 1 part of citric acid. This mixture can be sterilized with little or no caramelization.

ESTIMATION OF HÆMOGLOBIN

Anæmia in the prospective donor can usually be detected by the lack of colour in the mucous membranes. Individuals with good colour, as a rule, have normal hæmoglobin values. A hæmoglobin test, however, should be done, if possible, on every donor, and certainly on all who are in the doubtful class.

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*Obtainable from the Baxter Laboratories, and The Cutter Laboratories.

†Obtainable from the Abbott Laboratories.

Almost any of the standard methods is satisfactory for the routine estimation of hæmoglobin provided the operation is done by a trained technician, and the instrument first is calibrated against a standardized instrument such as a spectrophotometer, a photoelectric colorimeter, or against the Van Slyke method for oxygen-carrying capacity. The photoelectric colorimeter is the simplest, and usually the most accessible, instrument to use for comparison. If more than one technician is performing the test, the results should, and usually will agree, if the blood specimens are taken in a uniform manner. The hæmoglobin values should be expressed as grams of hæmoglobin per 100 c.c. of blood. The objection to the still common practice of expressing the values as percentage of the normal, is that the normal, or 100% value, differs with the different methods.

Of the various instruments used for estimating hæmoglobin the photoelectric colorimeter is one of the most satisfactory because it is simple to operate, it is accurate and it eliminates the errors of human judgment that enter into the use of many of the other instruments. If the Sahli, or other acid-hæmatin method, is employed, adequate time (30 minutes) must be allowed for the complete conversion of hæmoglobin into acid-hæmatin, to take place. The Dare instrument is satisfactory only in the hands of a skilled technician. The Tallqvist method is of little value because the scale has no accurate meaning.

The average or normal hæmoglobin value for healthy individuals in the eastern United States and Canada is about 15.6 grams % for men and 13.8 for women. There is considerable variation in these average values in different sections of the continent, and in different parts of the world. In setting a minimal hæmoglobin level for blood donors, it is now widely agreed that individuals with a hæmoglobin level of 12.3 grams % or less, should not be accepted.

One of the commonest sources of error in the estimation of hæmoglobin is faulty technique in obtaining the blood specimen. Many workers prefer to take it from the tip of the ear-lobe, because a liberal sample can easily be obtained with practically no discomfort to the donor. Experience has proved, however, that, compared with finger specimens, the hæmoglobin content of ear-lobe blood fluctuates much more and may be abnormally high, especially in cold weather. Some individuals, for example, have a hæmoglobin level of 20 grams % by ear, when the finger-stick specimens are much more consistently round 16.. The use of finger specimens, therefore, is recommended for the estimation of hæmoglobin.

In preparing for the finger puncture, the donor should be asked to wash his hands, and the finger to be punctured should be cleansed further with 70% alcohol, the excess being removed with a swab of clean paper tissue. As a rule blood may be obtained most easily from the third finger by puncturing it on the side nearest the little finger and slightly down from the tip. The puncture may be made with a sterile cutting needle while the finger is being pressed. Gentle pressure then should be applied slightly anterior on both sides of the finger (not on the front and back) and the first drop of blood should be removed with a paper tissue. If strong pressure is required to express the blood, another puncture should be made. If the test specimen is not properly taken, a correct value cannot be obtained even with the most accurate instrument.

A No. 4 straight suture needle with a three-edged tip is suitable for finger puncturing. The head of the needle may be inserted into a small rubber stopper and the needle, when not being used, may be kept immersed in 70% alcohol in a small vial or tube. The needle should be replaced periodically since the tip tends to become rusted.

Variations in hæmoglobin of as much as 15% may occur from day to day in healthy individuals. Much of the variation is only apparent, and may be due to the temperature of the hand and the site of the puncture. As a rule, the smaller the blood vessels, the smaller is the proportion of red-cells to plasma. Shallow punctures, therefore, tend to give a lower value. The hæmoglobin level usually is lower at the end of the day, during fatigue and during the onset and course of a cold.

Simplified method for testing hæmoglobin level in donors.—A simple adaptation of the copper sulphate method of Phillips, Van Slyke *et al.*[37] has been introduced by Thalhimer for telling whether the hæmoglobin level of the prospective donor is greater or less than the minimal acceptable value of 12.3 grams %. The procedure consists simply in letting a drop of the donor's blood fall from a capillary tube into a copper sulphate solution of specific gravity 1.052 (at 26° C.). If the blood sinks in the

solution, the indication is that its specific gravity is greater than that of the solution and that the hæmoglobin level is greater than 12.3%. On the other hand, if the blood remains stationary in the solution, or rises for a few seconds before sinking, the donor should not be accepted as the hæmoglobin is below the minimum value.

The copper sulphate solution may be obtained already prepared*, or may be made[37] from a stock solution containing 159.63 grams of $CuSO_45H_2O$ per litre at 26.2° C. The specific gravity of this solution should be 1.100. It should be checked by weighing 100 ml. in a volumetric flask at 26.2° C. and then weighing 100 ml. of distilled water in the same flask at the same temperature. The copper sulphate solution should weigh 10 grams ± 10 mgm. more than the water.

The final solution is prepared by diluting 51 c.c. of the stock to 100 c.c. in a volumetric flask at 26° C. Both stock and final solutions should remain clear.

The copper sulphate solutions must be kept stoppered to prevent evaporation, and the top of the bottles must be kept free of copper sulphate crystals.

The additional equipment required includes the following: (1) One or more vials or tubes preferably about 95 mm. high and 25 mm. in diameter, marked at the 30 c.c. level. (2) A small wooden block with a hole suitable for holding the vial. (3) Capillary tubes 0.88 to 1.1 mm. in diameter and about 70 mm. in length.† (4) Small rubber vaccine bulbs‡ for use with the capillary tubes. (5) Flat-end tooth picks, needle for finger punctures, 2 x 2 inch gauze wipes or sterile paper tissue, and alcohol. The needle should be left immersed in 70% alcohol when not being used.

Procedure.—The vial should be filled to the 30 c.c. mark with the test solution.

Having cleansed the donor's finger as previously described, the puncture should be made, and a blob of blood, at least 5 mm. in diameter, should be obtained without having to apply excessive pressure.

A capillary tube, fitted with a vaccine bulb and held in the horizontal position, then should be brought in contact with the blood which will enter by capillary action. If any air bubbles enter the tube along with the blood, the procedure must be repeated using a fresh tube.

Holding the capillary in the vertical position and resting the little finger on the edge of the vial so that the capillary tip is no further than 1 cm. from the surface of the solution, carefully express one drop of blood. The drop, on making impact with the surface of the solution, usually will form a small vortex which either sinks at a steady rate, or slows down and becomes stationary, or tends to rise again. Even if the vortex rises, ultimately it will sink. The donor is accepted only if the vortex sinks at a steady rate from the start. In each test, a small portion of the blood tends to remain on the surface of the solution. This should be removed with the flat surface of the tooth-pick before proceeding with another test.

Each filling of the tube (30 c.c.) is good for 25 tests.

In this test the assumption is made that the donor's plasma protein concentration is normal. Obviously, a subnormal level of the proteins will reduce the specific gravity and will tend to cause the drop of blood to rise even if the hæmoglobin be normal. This adds to, rather than detracts from, the value of the test, since persons with hypoproteinæmia should not be encouraged to donate blood. A high content of fat in the blood also will tend to cause the drop to rise. In the case of persons who do not appear to be anæmic, but who are rejected by the above test, a hæmoglobin determination should be done to establish whether or not the person is anæmic.

OBSERVATIONS ON THE COLLECTION OF BLOOD WITH STANDARD APPARATUS

Evacuated flasks.—When using the evacuated type of bottle for collecting blood it is customary to insert the sterile valve needle into the rubber stopper of the bottle with the valve closed. As soon as venipuncture has been performed the valve is partially opened with care. If opened completely, the vein usually will be collapsed and the flow of blood will cease.

Occasionally one may encounter a defective valve which permits air to enter the blood bottle, thus releasing part of the vacuum before the venipuncture can be done. For this reason some workers prefer to do the venipuncture first, and to insert the valve needle in the stopper of

* The solution may be procured from the Baxter Laboratories, Acton, Ont., in 300 c.c. and one litre bottles.

† Obtainable from Kimble Glass Company, Vineland, N.J.

‡ Obtainable from West Rubber Company, 117 Shackamaxon Street, Philadelphia, Pa.

the bottle when the blood begins to flow through the tubing. If this procedure is used, care must be taken to protect the valve against contamination by keeping it in a sterile wrapping until it is required. The collection of blood should be carried out with the bottle inverted and without manual agitation as previously described (see page 150).

Unevacuated bottles.—With the unevacuated type of bottle, a rubber vacuum bulb usually is provided to expedite the flow of blood (see Fig. 2). Certain makes of bottles of this type necessitate the removal of a cap and the application of a special head for collecting the blood. The head then must be replaced with a sterile cap, which in turn has to be replaced with another head when the blood is to be transfused. Obviously, in using this system, great care and skill must be exercised during the various manipulations to avoid contaminating the neck and mouth of the bottle. The manipulations should be carried out in a "sterile" room and with all the precautions previously outlined. The upper surface of the bottle and round the edge of the cap should be sterilized with tincture of iodine before removing the cap. After applying the head, it should be kept covered with a sterile towel. Also, after capping the bottle of blood a sterile paper wrapping should be tied or sealed round the neck of the bottle for protection during storage.

With the above system the contents of the flask must be agitated continuously during the collection of the blood. In dismantling the head and other parts for cleaning, the rubber gaskets should be removed.

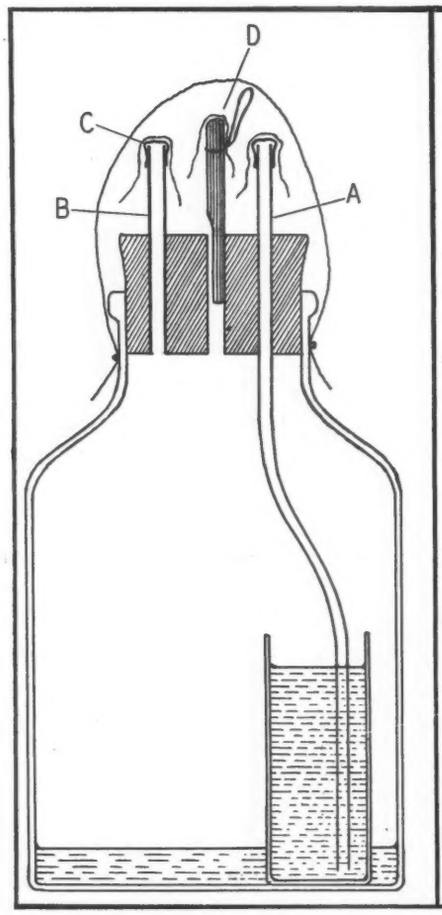

Fig. 1

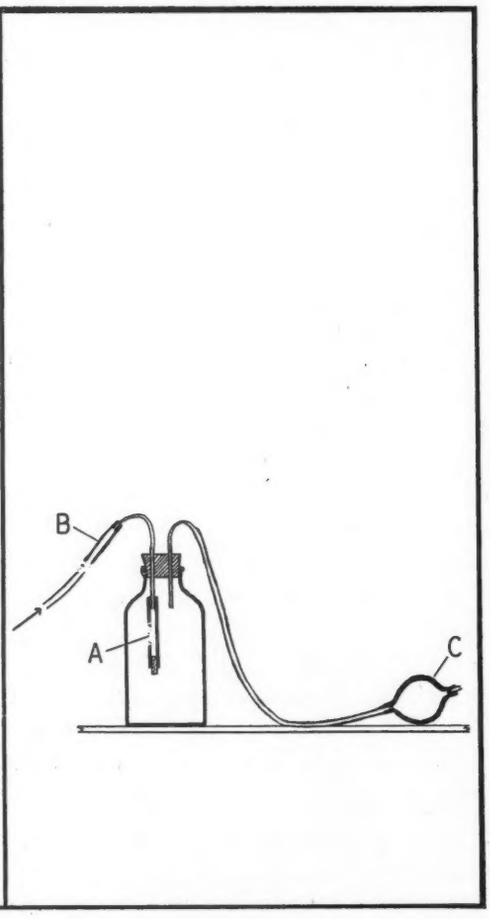

Fig. 2

BLOOD COLLECTION BOTTLE FOR ELIMINATING CARAMELIZATION

Fig. 1 illustrates a blood collection bottle designed by one of the authors (L.J.R.) and used in the hospital blood bank for more than two years with satisfaction. The dextrose solution (5%) is placed in the main flask, and the citrate (3%) is placed in the separate jar which is held in place by the air-inlet tube A. Both the latter and the blood-inlet tube B are sealed with small rubber caps C and covered with small pieces of gauze. The dowel D in the centre of the stopper has the lower portion cut away, and is placed in the position shown to permit escape of air during sterilization. The top of the set is covered with paper (butter-wrapping) tied around the neck of the bottle. To ensure sterilization all parts of the stopper, *i.e.*, stopper, tubes, rubber caps and dowel, should be moistened with pyrogen-free saline at the time of as-

sembly, and the complete set autoclaved without delay. It is desirable to sterilize the sets in cotton bags if they are to be kept in the cupboard for any length of time afterward. After sterilization, the dowel should be pressed into the stopper without opening the covering. When the solutions in the bottle have cooled, they may be mixed by tipping the bottle.

When blood is to be collected the rubber cap C, on the blood-inlet tube, is punctured with a No. 16 needle attached to the blood-collection tube, the needle being long enough to extend beyond the lower end of the tube B. To permit escape of air, a second sterile needle may be introduced into the same rubber cap, or the dowel may be pulled out slightly.

In administering the blood the cap C may be removed aseptically and the tubing, carrying the filter-drip and intravenous needle may be attached. After suspending the bottle in the inverted position a sterile No. 20 needle should be inserted into the rubber cap on the air-inlet tube.

VALVE FOR PREVENTING FORWARD FLOW OF AIR

A Bunsen valve attached to the *vacuum* bulb may be used to prevent forward flow of air when the bulb is compressed. The valve illustrated in Fig. 2 consists of a piece of fairly heavy-walled rubber tubing about 2½ inches in length with a slit A, about 1 inch long, cut in the side with a razor blade. The valve may be placed in a bottle as shown or may be housed more compactly in a piece of ¾ inch glass tubing.

It is advisable to have the valve slit about the length prescribed so that air can pass through it at venous pressure. In making up a valve for blood collection the tube B should be immersed in an antiseptic solution, such as 5% tricresol, for several minutes before assembling. It should then be permitted to drain, and the outside should be wiped with a moist cloth to remove antiseptic. The vacuum bulb and the attached tubing should be wired at the joints to make removal difficult.

When the set is being used for blood collection it is advisable to disconnect tube B from the blood bottle, should the operator be called away for a short time.

ASSEMBLY OF APPARATUS FOR INFUSION OF FLUID

Baxter and Cutter equipment.—(1) Stand. (2) Bottle containing blood or other fluid. (3) Sterile kit or tray containing: (*a*) Assembled filter-drip with tubing and needle adapter attached. (*b*) Two or three No. 18 needles with stilette wrapped in gauze or pinned through a piece of paper. (*c*) No. 16 or 18 needle attached to a piece of rubber tubing about 12 inches in length and provided at the other end with a glass tube loosely filled with cotton to serve as an air-filter, and carrying a piece of string by which the tube may be suspended. (*d*) Three screw clamps. (*e*) Six 2 x 2 inch gauze wipes. (*f*) Two No. 18 needles for puncturing the rubber stopper. (*g*) Forceps.

If preserved blood is to be administered the red cells should be suspended carefully, as previously described.

The filter drip should be inserted directly into the rubber stopper in the manner outlined by the manufacturer. Insertion may be facilitated by first puncturing the stopper two or three times with a needle (sterile, see *f* above).

The bottle then may be suspended on the stand and as soon as the blood begins to drip from the strainer in the filter-drip, a screw clamp should be placed on the tubing.

The air-filter needle (*c* above) is inserted into the rubber stopper and the tubing is suspended from the stand with the end about the level of the upper end of the blood bottle (Fig. 3). The majority of workers omit the filter and simply pierce the air-inlet with a sterile needle.

Holding the intravenous needle adapter and needle in the vertical position and about the level of the strainer in the filter-drip, the screw clamp should be loosened so that the blood or other fluid will completely fill the tubing and the adapter. The latter then should be raised to above the level of the blood bottle and lowered again a few times to make sure that all air-bubbles are expelled from the tubing and that the *lower* chamber of the drip is about two-thirds filled with the fluid. The tubing and adapter should again be completely filled.

Proceed to administer the fluid.

If, during the infusion, the level of the fluid in the lower chamber of the drip should drop, the tubing should be clamped at least one foot from the drip, and the chamber should be filled to the proper level by alternately compressing and releasing the tubing, above the clamp, with the fingers of both hands.

Preserved blood should be administered without warming and preferably at a rate not exceeding 4 drops a second.

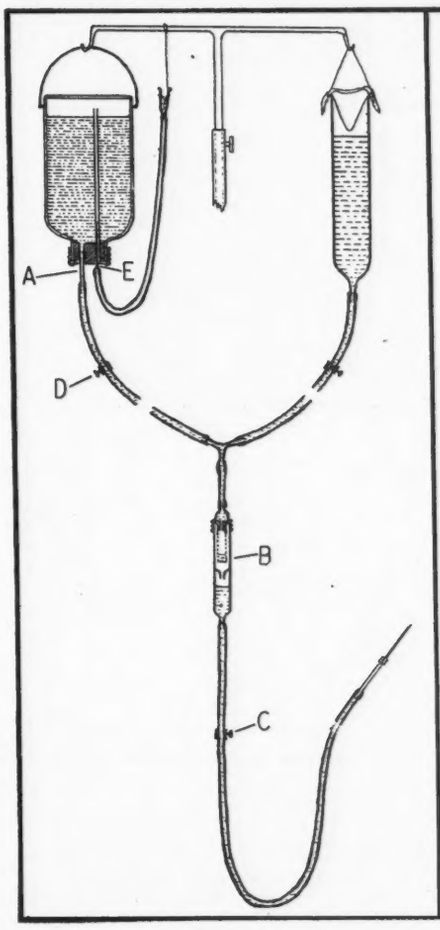

Fig. 3

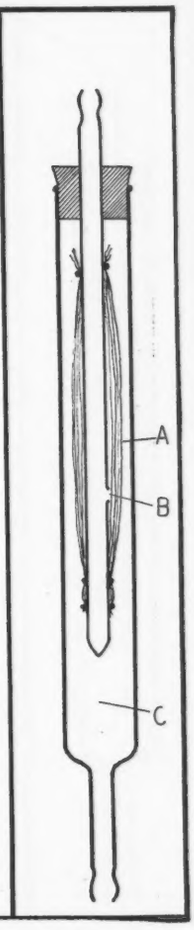

Fig. 4

Bottle and infusion-funnel assembly.—If it is desired to have an infusion funnel in the set-up, the apparatus may be assembled as illustrated in Fig. 3. Instead of the cannula A inserted into the stopper of the blood bottle, a second filter-drip may be used with a coarser strainer (40 mesh to the inch) than that in the lower filter-drip B (200 mesh to the inch). The ends of the rubber tubing should be tied on to the glass parts. Close the three screw clamps.

To fill the tubing, raise the glass needle adapter to the level of the funnel and permit the saline-dextrose or other solution from the funnel to fill the tubing and adapter. Raise the adapter above the funnel, and lower it, alternately, until the lower chamber of the filter-drip is two-thirds filled. Close the clamp C.

With the surface of the solution in the funnel slightly lower than that of the blood in the bottle, open the clamp D below the bottle, leaving the one under the

funnel open. At this stage, insert the needle E of the air filter into the stopper of the blood bottle. As soon as the blood has filled the tubing and connected with the saline in the Y-tube, close the clamp D below the bottle. If air-bubbles become entrapped in the Y they should be expelled into the funnel by pinching the tubing above the filter-drip, or by raising the needle adapter, permitting a slight back-flow of the solution.

If a filter-drip is inserted into the blood bottle, the lower chamber can be filled by raising the saline funnel, permitting the solution to run into the chamber. Finally, the system should be inspected to see that the tubing is free from large air-bubbles.

In many hospitals it is customary to precede and follow the blood transfusion with an infusion of 50 to 100 c.c. of saline-dextrose (an arbitrary mixture of physiologic saline and 5% dextrose solutions). Preserved blood and saline should *not* be administered together throughout the transfusion, since some of the red cells, particularly if stored for more than three weeks, tend to become less stable to saline.

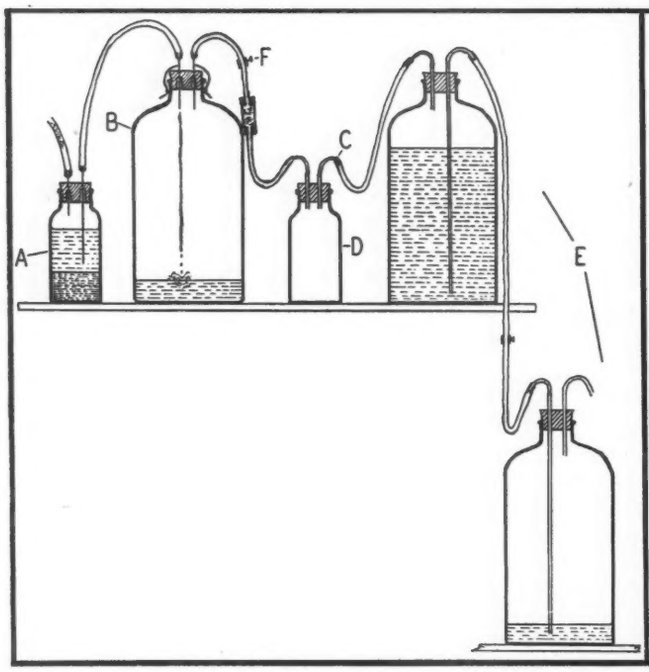

Fig. 5

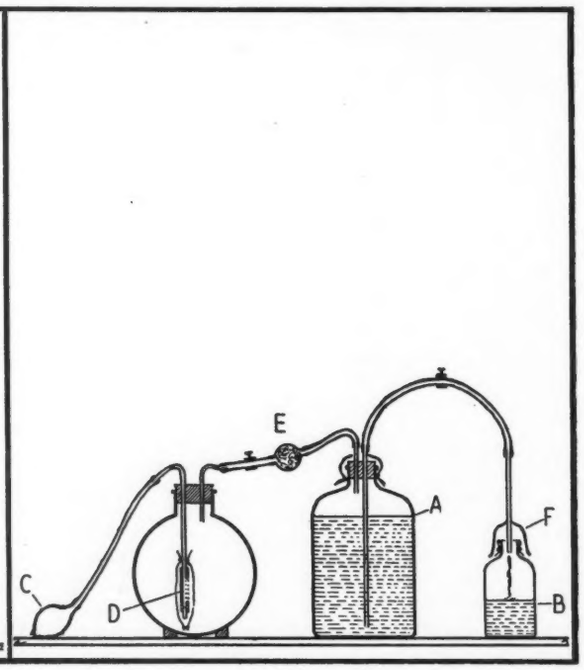

Fig. 6

FILTER FOR BLOOD AND PLASMA

An improvised combination filter and drip, designed by Strumia of Bryn Mawr Hospital, is illustrated in Fig. 4. Fine cotton gauze A is wrapped fairly tightly around the centre tube to make four to six layers. The ends of the wrapping are tied and after cutting away the excess gauze at the lower end, the loose threads are tied around the tube. When using the apparatus the space C below the glass tip should be filled about two-thirds with fluid as previously described. B is a hole in the centre tube.

POOLING OF PLASMA

Fig. 5 illustrates the transfer of plasma from the blood bottle A to the pooling bottle B by applying suction to the tube C on the trap D.

In the diagram an ordinary syphon system E is represented as a means of producing the vacuum. When the lower bottle becomes filled aspiration may be continued by reversing the position of the two bottles. This device can be quickly improvised in the field when more convenient vacuum producing devices are not available.

The top of the pooling bottle should be kept protected against contamination. A loosely packed cotton wool filter should be placed between the pooling bottle and the trap.

If a water pump is used to provide the reduced pressure a foot-pedal control for operating the suction at F may easily be improvised by using a 6-inch light strap hinge for compressing the tubing. The wings of the hinge may be hammered near the fulcrum to make them fit closely against each other, and the hinge, when installed, may be kept closed by means of a spring and opened with a foot-pedal attachment. This method of control simplifies the manipulation and makes it possible to avoid a greatly reduced pressure in the pooling bottle.

DISPENSING OF POOLED PLASMA

After the sterility of the pool has been established the plasma may be dispensed into 500 c.c. bottles as indicated in Fig. 6. If a special cubicle is not available the working area should be wiped with a damp cloth and the surface of the bench should be covered with moist towels. A burner should be placed near by.

The plasma from A may be dispensed into small bottles B by applying pressure with the bulb C. The Bunsen valve D in the balloon flask may be covered with a few layers of gauze soaked in 5% tricresol, to provide an initial filtration of the air. E represents a cotton-filled filter, and F an apron-protected dispensing head. The entire assembly from E to F should be sterile, and a fresh one should be used with each pool. (The tubing in the set should be wet inside with pyrogen-free saline before autoclaving to facilitate sterilization). The bottles B should be prepared as described previously in the text (see page 148) with a double covering of paper over the mouth, the under one having a ½ inch hole. After each bottle is filled the upper sterile cover may be replaced until the sterile rubber stoppers are to be applied.

Care should be taken not to develop too great a pressure in the system to avoid blowing out the stoppers or breaking the plasma bottle if the stoppers are secured. Only a small pressure is required for operating the system.

If standard evacuated bottles (500 c.c.) are used as the final containers, the above described pressure system is unnecessary, but a filter must be placed on the air-inlet of the plasma pool.

CONVERSION OF PLASMA INTO SERUM

Citrated plasma may be converted into citrated serum by the addition of calcium chloride. The proportion of the latter salt used by Clegg and Dibble[15] is as follows: plasma 500 c.c.; calcium chloride (reagent) 300 mgm.

A similar procedure has been described by Maizels[16] and others.[3] The plasma for this purpose must be fairly fresh. The main advantage of the treatment is to eliminate the formation of fibrin in the material during storage. The serum, after removal of the precipitated fibrin, has been used by the above workers, and also by one of the authors (L.J.R.) with satisfactory results.

AIR FILTER FOR "STERILE" ROOM

Fig. 7 illustrates a filter for removing dust from the air entering the plasma cubicle.

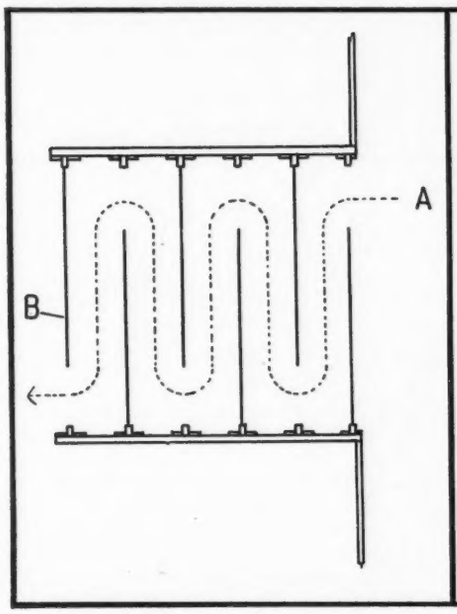

Fig. 7

Air entering from outside at A passes through a baffle consisting of doubled sheets of a cheese-cloth B stretched on wooden frames (2 ft. x 2 ft.), and impregnated with light mineral oil (light machine oil) applied with a hand sprayer. The box may be constructed with one side removable so that the frames can be pulled out when the sheets are to be replaced. The first two sheets usually require frequent replacement. If possible the baffle should be installed at least two feet above the floor. If the air is forced into the room, or if a blower is used in the air outlet, the number and size of the frames should be increased, and they should be placed closer together.

ACCURATE CONTROL OF REFRIGERATOR TEMPERATURES

The simplest and most effective way to achieve accurate temperature control in the refrigerator is illustrated in Fig. 8. The freezing unit A in the separate compartment, which has an opening at the top and bottom, is maintained at as low temperature as possible (preferably about –20° C.) by setting the control on the compressor. When the temperature in the refrigerator drops to 6° C. a thermostat activates the (furnace) damper motor B,* thus raising the plate C and closing the lower aperature (6″ diameter) of the freezing chamber. When the temperature in the box rises the aperture automatically is opened again. The fan D should have a squirrel-cage type of motor to cut down heating, and should be placed on a sponge-rubber cushion to minimize vibration. The thermostat bulb may be placed at E with the copper tubing running through the hole F to the adjustable switch* outside the box.

If the bottles, etc., in the refrigerator are placed so that a 4-inch clearance is left at the sides of the box to permit the circulation of air, the temperature can be kept constant within a degree or two. The freezing unit should be kept free of excessive ice. The efficiency of the box may be increased, and the rate of frosting of the coils may be reduced, by putting false doors behind the regular ones. These may be improvised of three-ply wood with large windows of fairly heavy cellophane. A similar window should be placed in the front of the freezing chamber.

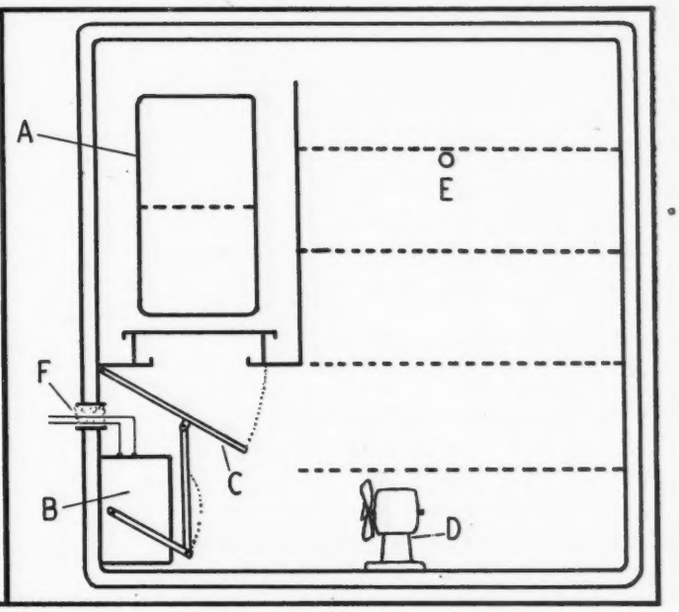

Fig. 8

* This equipment may be obtained from Minneapolis-Honeywell Company.

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Case Report

A CASE OF PERIPHERAL NEURITIS FOLLOWING A SULFATHIAZOLE REACTION

By Surg.-Lieut. J. P. Robb, R.C.N.V.R.

One of the toxic manifestations of sulfathiazole that has been rarely reported is peripheral neuritis. That sulfathiazole can produce a peripheral neuritis was shown by Bieter *et al.*,[1] working with chickens. They produced changes in the peripheral nerves of increasing severity with sulfanilamide, sulfapyridine, sulfathiazole, sulfamethythiozole, sulfanilyl dimethyl-sulfanilamide and sulfaphenyl thiozole respectively. They also reported a case of peripheral neuritis which they felt was due to sulfathiazole. Blake and Dodusk[2] are reported to have observed an unquestionable case of bilateral protracted ulnar neuritis in a patient who developed an excessively high blood level of sulfathiazole.

The following is a case which is probably the result of sulfathiazole, which to date, four months after the predication, has shown no signs of recovery.

G.R., aged 20, was admitted to R.C.N.H. (Rockhead) on October 5, 1943, with a diagnosis of acute gonorrhœa following exposure seven days previously. There was nothing unusual about the case and he was started on sulfathiazole orally. He received six grams for the first three days then four grams every day for five days. On the eighth day he complained of a headache and general malaise. The temperature was 100°. The drug was discontinued and the following day he felt perfectly well and the temperature was normal.

He continued to show a positive smear for gonococcus and on October 18 he was again started on sulfathiazole and had received two grams when he developed a severe reaction. He had an erythematous rash over his face, arms and body and subcutaneous nodules about the face and neck. He complained of chills, nausea, numbness of his hands and arms. The temperature rose to 104° F., he vomited and became mildly delirious.

Intravenous fluid was administered. Following recovery of complete consciousness, he complained of severe aching pain in the back of the neck and through both shoulders. His elbows became extremely sensitive and even the weight of the bed clothes caused pain. Because of the pain, movement of the arms was limited. This so-called paralysis disappeared and he was discharged 18 days later complaining only of vague aching discomfort about both shoulder joints. Following the severe reaction, the urethral discharge became negative for gonococcus and no further treatment was necessary.

Returning for routine check up at the genito-urinary clinic he still complained of discomfort about the shoulders. At the time no note was made of any objective damage about the shoulder joint. On December 23 examination by the medical consultant revealed a typical winging of the right scapula. This was definite. There was some questionable atrophy of the right and left supraspinatus and infraspinatus, but there was no loss of function of the muscles. Neurological examination, x-ray and lumbar punctures failed to reveal any evidence of any disease of the spinal cord. Four months later the winging of the scapula was unchanged (Fig. 1). This was the only objective sign of any disease of the nervous system, but he complained of a little slowness of fine movements of the left hand.

Fig. 1

There is no question that this patient had a peripheral neuritis involving the right long thoracic nerve. The original pain in the shoulders and later subjective complaint of slowness of movement of the fingers of the left hand suggest that the neuritis was even more widespread. Whether the neuritis was a direct result of the sulfathiazole or due to an idiosyncrasy to the drug cannot be determined.

The case was of interest because firstly, it showed very clearly the winging of the scapula associated with lesions of the long thoracic nerve, supplying the serratus anterior and secondly, because of the possible etiological factor—sulfathiazole.

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Clinical and Laboratory Notes

A GUIDE FOR PENICILLIN TREATMENT

(Prepared by the Medical Advisory Committee on Penicillin)

Limited quantities of penicillin are being released through the Office of the Controller of Chemicals for use in the civilian practice of medicine. In order that the available penicillin may be used to the best advantage for the greatest number of patients some measure of selection must be exercised in regard to the type of case to which the administration of penicillin is justified under present circumstances. It is recommended that the following serve as a guide in this connection:

CLINICAL USE OF PENICILLIN

I. Penicillin should be used in the treatment of the following conditions:

1. **Septicæmias** caused by *Staphylococcus aureus, Streptococcus hæmolyticus,* or *Pneumococci.*

2. **Meningitis** caused by *Staphylococcus aureus, Streptococcus hæmolyticus,* or *Pneumococci,* and cases of meningococcal meningitis not responding after two to three days of adequate sulfonamide therapy.

3. **Gas gangrene.**

4. **Serious infections** caused by *Staphylococcus aureus, Pneumococcus, Streptococcus hæmolyticus* and anaerobic streptococci, such as:

(*a*) Acute osteomyelitis.
(*b*) Cellulitis.
(*c*) Puerperal sepsis.
(*d*) Mastoiditis and otitis media.
(*e*) Cavernous and lateral sinus thrombosis.
(*f*) Staphylococcal and hæmolytic streptococcal pneumonia.
(*g*) Pneumococcal pneumonia not responding after three days of adequate sulfonamide therapy.
(*h*) Empyema and suppurative arthritis.
(*i*) Carbuncles and soft tissue abscesses.

5. **Gonococcal infections** causing arthritis, ophthalmia, endocarditis and epididymitis.

NOTE: If supplies of penicillin permit, cases of gonorrhœa not responding to adequate sulfonamide therapy may be treated.

II. Penicillin may be a useful and effective agent in the conditions listed below but further clinical investigation is necessary to define its value.

(*a*) Chronic osteomyelitis (before and after operation).
(*b*) Actinomycosis.
(*c*) Subacute bacterial endocarditis.
(*d*) Perforations of abdominal viscera and associated subphrenic, pelvic and other abscesses, if the predominant micro-organism is Gram-positive.
(*e*) Syphilis.

NOTE: Although encouraging results have been obtained with penicillin in the treatment of syphilis, present supplies of penicillin do not warrant its use in the treatment of this condition and distribution for this purpose cannot be approved.

III. Penicillin is of little or no value, and should not be used, in the treatment of the following conditions:

(*a*) All infections caused by viruses, such as: influenza, primary atypical pneumonia, encephalitis lethargica and anterior poliomyelitis.
(*b*) Tuberculosis.
(*c*) Typhoid fever, dysentery and cholera.
(*d*) Undulant fever and tularæmia.
(*e*) Rheumatic fever and rheumatoid arthritis.
(*f*) Infections in which the dominant organisms are Gram-negative bacilli.
(*g*) Infectious mononucleosis.
(*h*) Hodgkin's disease, leukæmias and malignant disease.
(*i*) Ulcerative colitis.
(*j*) Meningitis and other conditions due to *Hæmophilus influenzæ* or *Bacillus of Friedlander.*
(*k*) Pemphigus.

ADMINISTRATION OF PENICILLIN

Penicillin is supplied as a yellowish-brown powder in ampoules or vials containing 100,000 units each. To maintain the potency of the preparation the ampoules or vials must be stored at refrigerator temperature. The powder is freely soluble and may be dissolved in a small amount of distilled water, physiological saline, glucose-saline or glucose solution. When reconstituted as a solution most penicillin preparations are relatively unstable. It is advisable, therefore, to make up each day only enough solution to last for 24 hours or at most 48 hours and to store the unused portion, under aseptic precautions, at refrigerator temperature. In preparing penicillin for systemic administration it is customary to dissolve the powder containing 100,000 units in 20 c.c. sterile, pyrogen-free distilled water or sterile physiological saline to give a solution with 5,000 units per c.c.

Either the intravenous or the intramuscular route may be used for the systemic administration of penicillin, but no matter which route is used penicillin is rapidly excreted in the urine. Following a single injection, it is impossible to detect penicillin in the blood three to four hours later. In order to maintain an

adequate blood concentration of penicillin it is necessary to repeat the injections every three to four hours or to give the penicillin as a continuous intravenous infusion.

Intravenous administration may be accomplished : (1) by injecting a dose every three hours, day and night, into the rubber tubing of a continuous intravenous drip; (2) by mixing half the daily dose in 1 litre of infusion fluid (saline or glucose) and adjusting the flow of the intravenous drip to deliver this amount in twelve hours (30 to 40 drops per minute).

If the intramuscular route is used, the total volume of fluid injected should be small and contain 5,000 units of penicillin per c.c. The injections should be repeated every two to four hours, day and night, depending on the severity of the infection. Subcutaneous injections are not recommended since they are apt to be painful.

DOSAGE OF PENICILLIN

The dosage of penicillin to be used in the treatment of a disease varies with the age and weight of the patient and with the type and severity of the infection. More experience with this new chemotherapeutic agent is required before any final decision in regard to dosage can be made. However, satisfactory results have followed the use of penicillin at the dosage outlined below, but it should be realized that modifications may have to be made for each individual case.

A. *Systemic therapy.*—For *septicæmias* and other severe infections in adults it is recommended that the daily dose be 120,000 units until the temperature returns to normal and the condition of the patient is satisfactory. It is possible that a larger daily dose may be required for fulminating infection.

In contrast to the severe infections, which require on the average 1,000,000 units of penicillin, uncomplicated cases of gonococcal urethritis respond well to 100,000 units of penicillin given intramuscularly in doses of 10,000 units every three hours. However, cases of gonorrhœa with complications, such as arthritis, may require the same daily dose as a severe infection.

In cases of *meningitis,* in addition to systemic therapy, it is necessary to inject penicillin into the subarachnoid or cisternal space because diffusion of penicillin from the blood into the cerebrospinal fluid does not occur in appreciable amounts. Following removal of cerebrospinal fluid, it is recommended that 10 c.c. of a penicillin solution containing 1,000 units per c.c. in physiological saline be injected intrathecally each day until the signs and symptoms of meningitis have subsided.

In *infected pleural effusions,* 50,000 units of penicillin in 50 to 100 c.c. of physiological saline should be injected into the pleural cavity every 48 hours following the aspiration of the pus or fluid. After four doses the effusion usually remains sterile and may be absorbed following subsequent aspirations. In other cases drainage is necessary because the pus becomes too thick to be aspirated or infection recurs.

B. *Topical applications.* — Penicillin solutions containing 250 to 500 units per c.c. may be instilled into infected sinuses or applied locally. Such solutions should not be used as irrigating fluids since several hours of contact of penicillin are necessary before its full effect on susceptible bacteria is exerted.

[*Copy of letter sent to superintendents of all hospitals in Canada over 25 beds.*]

PENICILLIN SUPPLIES

Our own Canadian production of penicillin at present is all required for military use but the War Production Board in Washington has made a limited quantity available for civilian use in Canada. The manufacture and distribution of penicillin in Canada is controlled under C.C. Order No. 33. The quantity of penicillin available for civilian use will be distributed under this Order through the Office of the Controller of Chemicals. To assist the Controller a Committee known as the "Medical Advisory Committee on Penicillin" has been appointed.

In order that the available penicillin may be used effectively and to the best advantage for the greatest number, it is desirable that patients requiring the drug be treated in hospital. Supplies will not be adequate for distribution to all hospitals through the usual commercial channels but a public general hospital of over 25 beds (excluding bassinettes) may purchase penicillin on a quota basis through the Office of the Controller of Chemicals provided the hospital authorities agree to limit its use during the initial period to the treatment of infections recommended by the Medical Advisory Committee on Penicillin, and submit at the end of each month a list of the conditions treated with penicillin. It is recommended that your Medical Staff appoint a small committee to advise on the selection of cases and the use of penicillin.

The monthly quota for each hospital will be based on its bed capacity and on the available supply of penicillin. The price will be $6.00 per 100,000 units. The allotment may be purchased in whole or in part at one time by the completion of the enclosed order form—Form D "Penicillin Purchase Order"—and forwarding it in duplicate to the Office of the Chemical Controller, 1235 McGill College Avenue, Montreal, Que. Your order will be charged against your monthly quota and, on the same day, transmitted for delivery. However, quantities not ordered against one month's quota will not be carried over into the next month. If your monthly quota proves insufficient for your needs consideration will be given to a request for additional penicillin if supplies permit.

Prior to the first day of a succeeding month your hospital will be notified of its quota for that month. Your hospital is invited to purchase all or a part of that quota on the first of the month or as soon thereafter as is possible or desirable. Allotments for succeeding months will be handled in the same manner, and this practice will continue until supplies are adequate for distribution through the regular commercial channels.

In certain emergencies it may be impossible for patients requiring penicillin treatment to be admitted to hospital. Physicians in need of penicillin for such cases must apply to the nearest hospital, as the Controller of Chemicals will deal only with orders placed by hospitals. If such an application is made to your hospital and it is found that the patient is a suitable case for penicillin treatment, you may supply the physician from your quota. If you cannot supply the

necessary quantity of penicillin from your monthly quota to meet this special need, communicate with the Office of the Controller of Chemicals.

Your co-operation in making penicillin available for civilian use in your area is invited.

E. T. STERNE,
Controller of Chemicals.

A PORTABLE TRACTION TABLE

By Surgeon-Commander H. S. Morton, R.C.N.V.R.

Consultant Surgeon, Esquimalt Naval Base, B.C.

This table is presented as a simple portable traction table which may be used on board ship, in the field or in a base hospital. The general scheme is somewhat similar to the usual traction table, but several distinctive features have been developed. It began as a box with a simple pelvic support. Foot-pieces were added, knee supports were made; and then it was converted for use in body casts. It has now reached the stage where it can be used for most of the fractures of the trunk and limbs.

The apparatus consists of a wooden base, 20 x 46 inches, on which slides a square wooden box, 15 x 15 x 9 inches. At one end of the base board is attached a metal disk for the pelvic rest, and projecting tubes to support the uprights. Fig. 1 shows the table set up for the lower extremities.

The individual components can most easily be described separately:

1. The box is covered by a leather cushion. Projecting from one end is a sliding shelf which will support the head, and under this a drawer for small accessory parts. At the other side of the box is a pin which will fix it in any position on the track. Near the top of the box, on this side, is an attachment for the bar which holds the canvas sling, used in fractures of the vertebræ.

2. *The pelvic rest.*—This maintains the pelvis at a height of nine inches, and is detachable. It has been made in two sizes—a large and a small.

(*a*) Above the pelvic rest is a tall post, at the top of which two flag-like projections swing, and these can be used to support the knees with a sling. (b) Otherwise a short upright perineal post may be used. For pelvic fractures no upright is needed.

3. *The projecting tubes.*—Two tubes project from the metal base and rotate in an arc of 55 degrees, supported by a track ten inches from the pivot point. These tubes carry a buttressed upright which in turn supports the adjustable foot-pieces.

The foot-piece is an original design which can swing or rotate in any desired plane and is adjustable by means of two screw clamps. When these have been tightened in the desired position, the screw mechanism may be used for traction (Fig. 2). The foot-piece also carries an "L" shaped attachment, which may be used to keep the sole of the foot free of the foot-piece while a plaster cast is being applied.

The clearance during the application of a hip spica is nine inches for the body, at least eight inches for the leg, and two inches for the sole of the foot. This has been found to be more than ample for all practical requirements. The range of movement is sufficiently large to allow for double abduction up to 120 degrees, while the length of the tubes, bars and screw mechanism has been adjusted so that they will fit a small child or a man 6′ 6″ tall.

Body casts.—The pelvic support and foot-piece are removed and replaced by two uprights, which support a cross bar at a height of 24 inches above the horizontal tubes. The height of this cross bar is also adjustable, as well as its distance from the box. Fig. 3 shows a patient in position for application of a body cast, using the box for the thighs and the cross bars for the shoulder region. The more comfortable position, so the patients tell me, is to use the box for the shoulder tips, letting the patient grasp the sling attachment on the box as a handle, while the ankles are raised upwards by a "handy-billy" to the desired amount of hyperextension.

Arm traction.—For arm traction the portable traction apparatus is placed across the narrow wooden table and a pillow laid on the metal track near the pelvic upright. The patient lies on the table so that the upright fits into the axilla or the bend of the elbow, depending on the site of the fracture. With "Chinese basket" finger-stalls on the five digits, traction is applied on the screw mechanism through a spreader bar and a system of equalizing pulleys. Instead of these, skeletal or other forms of traction may be used and merely attached to the equalizing system of pulleys. For accurate calibration of the traction a spring balance may be inserted between the screw traction and finger cots (Fig. 4).

For fracture of the os calcis.—The upright may be used as a fulcrum, and traction applied to the forefoot and heel, using the manipulation of Yoerg.[1] For this particular manœuvre the box and the horizontal projecting tubes are removed.

For fractures of the pelvis.—The use of the pelvic rest, with the patient lying on the side, either the affected or the unaffected side, depending on the pressure required (Fig. 5), is the method advised by Watson-Jones,[2] and it has been found to be most successful in fractures of the pelvis.

Radiographs may be taken of any limb or the trunk during manipulation and before and after the application of a plaster. The fluoroscope may be used if so desired. For fractures

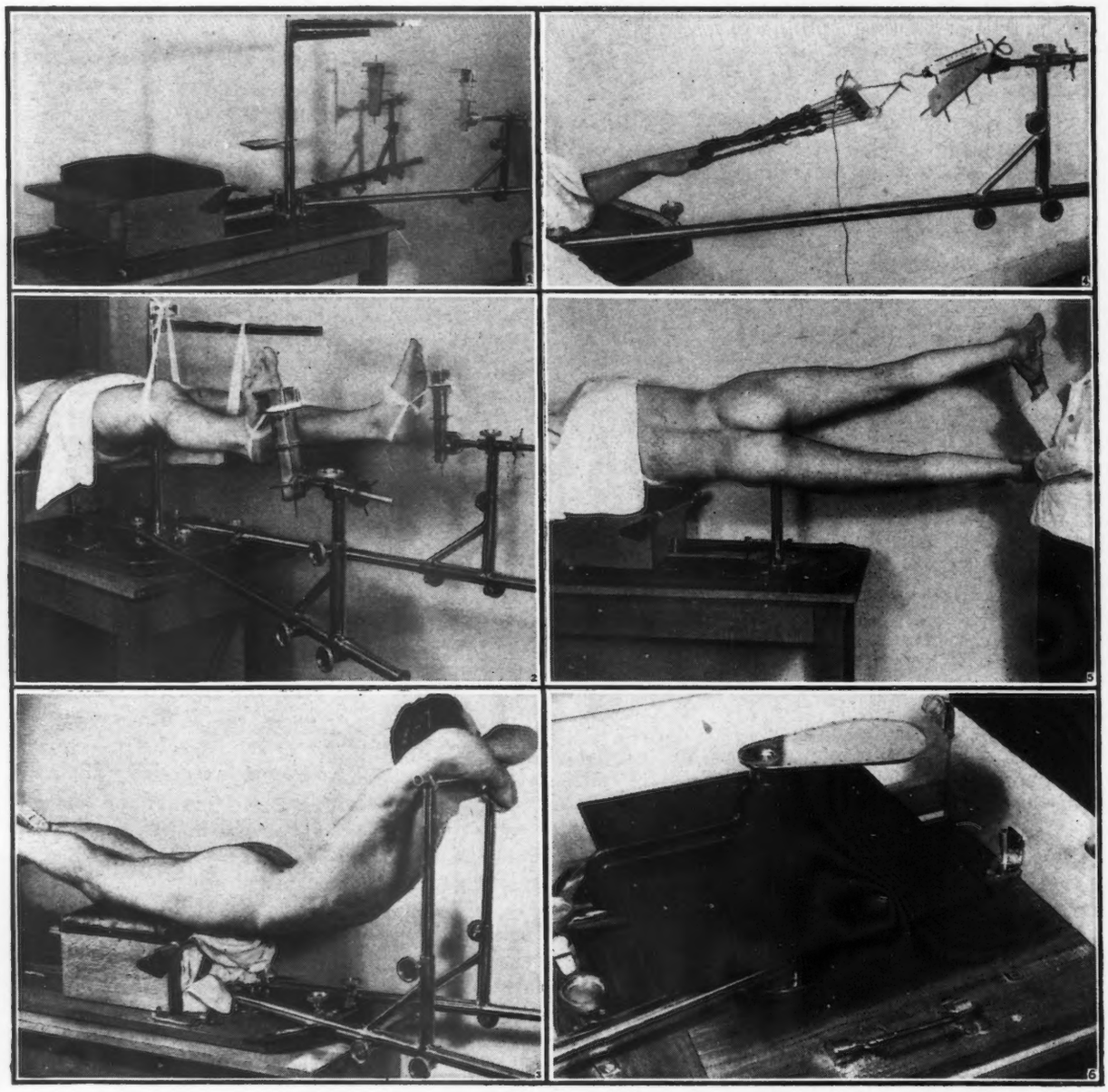

Fig. 1.—Traction apparatus set up for fractures of the lower extremity. **Fig. 2.**—Patient in position, detail of foot pieces. **Fig. 3.**—Position of patient for application of a body cast. **Fig. 4.**—Apparatus across table showing digit traction with spring balance. **Fig. 5.**—Position of patient for a fractured pelvis. **Fig. 6.**—Pelvic rest with cassette holder.

of the neck of the femur a special cassette holder has been made, modified from the Charles Bradford type (Fig 6).

CONCLUSION

This table has been used for fractures of the trunk, femur, leg, foot, arm and forearm. It is of very simple design and construction, and can be stored in a small space. Its adaptability has been proved at two widely separated naval bases. For these reasons it is recommended for use afloat, in the field and in any hospital, large or small, where expensive orthopædic tables are impracticable.

This table has been made through the very kind co-operation of the Mechanical Training Establishment, H.M.C.S. "Naden II". I should like to express my appreciation to the officers and ratings of this establishment for their helpful suggestions and for solving the problems arising from its construction.

The encouragement and assistance of the medical, executive and photographic branches is gratefully acknowledged.

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Editorials

REHABILITATION OF MEDICAL OFFICERS

THE all-essential factor in rehabilitation is well-advanced preparation. It is for this reason that such efforts are being made to estimate the probable future needs as well as the means for dealing with them. A committee has been at work in the Association for some months on this problem, but the nature of the task requires above all a co-ordination of all available information. The most important source is the Canadian Medical Procurement and Assignment Board. This organization has undertaken to find out what the medical officers of the Armed Forces want to do on demobilization. The investigation has been made by the means of a questionnaire, and the results so far, whilst not complete, are representative of a large enough group to allow of a fair estimate as to what the needs will be. The answers so far reported on do not go beyond March, 1944, and it is recognized that as the war goes on the type of medical officers for the final demobilization will tend more and more to consist of young recent graduates. This may in time cause an important shift in the outlook of the men as regards their post-demobilization plans.

So far, however, the main features of the situation are plain. There are roughly four main groups into which the medical officers may be divided, according to their stated needs: (*a*) those who want to take postgraduate work as soon as they are demobilized: (*b*) those who wish to return to civilian practice at once: (*c*) those who want to get back to practice soon, but would like a short refresher course either at once or later; and (*d*) those who wish to readjust themselves to conditions of general practice with the intention later of fitting themselves for a specialty.

The majority of the medical officers (67.3%) have said that they wish to take postgraduate training; 23.5% wish some form of postgraduate work before they enter civilian practice and the remaining smallest group wish to go into civilian practice as soon as they are discharged.

These requirements will, of course, be dealt with by educational bodies, and plans for handling them have been under consideration for some time. Probably the main difficulty will arise in the large number of men seeking postgraduate education. Both accommodation and teaching staff will be taxed to the limit. But it is unlikely that a very large number of men will be released at any one time.

Another aspect to be considered is that of protecting the interests of the men who expect to return to their practices. It is felt that much can be done by deliberate effort on the part of those at home to direct patients to return to the men under whose care they were before military duty intervened. Plans are being considered for organized efforts along these lines.

HEALTH IN GREAT BRITAIN*

A REVIEW of the general health in England in the past year presents a varying picture. For the first three-quarters of the year conditions were exceptionally good. In the autumn however influenza in epidemic form developed, and reached its peak in December nullifying the earlier improvement. It was this epidemic which raised the 1943 rate above that of 1942, but even so, it was better than in 1940 or 1941. The last serious outbreak of influenza in Britain was in 1940.

A most encouraging feature is noted in the increase in birth rate, which was the highest reached since 1926. The excess of births over deaths in England excluding deaths in military personnel outside of the country, was more than 175,000.

At the same time there was continued improvement in infant health, the infant mortality rate reaching the lowest point for England of 48 per 1,000 live births. Further, the aggregate mortality from the communicable diseases of childhood based on data from the large cities, was quite moderate. Chief amongst the contributing factors in this respect was the decline in deaths from

* Based on Statistical Bulletin of the Metropolitan Life Insurance Co., March, 1944.

diphtheria. Cerebrospinal meningitis showed two striking features: first, the incidence fell very sharply from that of the previous year, which was in contrast to a corresponding rise in the United States for the same period, and, second, the case fatality remained low, due to the use of the sulfa drugs.

Tuberculosis apparently cannot yet be fully reported on, but the indications for the first six months are that the year's record will show considerable improvement over the first two war years, and may even be as low as in the last peace year. This is of special interest in view of the war conditions.

It is felt that the limitations in food supplies and the careful rationing are responsible for the improvement noted in the mortality from diabetes; the first six months of 1943 deaths from this cause were 12% fewer than in 1942 and nearly 30% fewer than in 1940.

Evidence of the high morale amongst the British people as well as decreased tension, was seen in the decline from mortality from peptic ulcers. In the first half of 1943 this cause of mortality fell below that of the last pre-war year. Improvement in the suicide rate is also shown, the rate being 25% lower than in 1939. And a further encouraging sign is the decline in the number of inmates in institutions for mental disease and defectives. Possibly this is attributable to wartime activity and employment.

Motor vehicle fatalities have shown a marked decrease as compared with the corresponding figures for 1942 and 1941, when there was a sharp rise in the rate.

Editorial Comments

Penicillin for Civilian Use

In the editorial comments of the May issue of the *Journal* it was mentioned that a very limited quantity of penicillin produced at the Banting Institute under the auspices of the National Research Council was being distributed for civilian use in the treatment of staphylococcal septicæmia and staphylococcal meningitis. It was intimated also that there was some prospect of larger quantities of penicillin being made available for civilian use within the next five or six months.

The Department of Munitions and Supply has now announced that public general hospitals of over 25 beds may purchase penicillin on a quota basis for restricted civilian use through the Office of the Controller of Chemicals. Smaller hospitals may receive supplies for specific cases by appealing to the Controller of Chemicals who will act on the advice of a Medical Advisory Committee.

In order that the members of the profession may become more fully acquainted with the conditions under which this distribution is made we are publishing the letter sent to the superintendents of all public general hospitals of over 25 beds and the Guide for Penicillin Treatment prepared for the Controller of Chemicals by the Medical Advisory Committee on Penicillin.

The Vancouver Medical Association and Major Jukes

At the annual meeting of the Vancouver Medical Association last May an address was given by Major A. H. Jukes, D.S.O., O.B.E., which has since been reprinted and distributed throughout the whole country, under the title, "The Doctors' Dilemma, Political and Economic". The author closed his address with a resolution in which he embodied his main points, and he suggested that the Vancouver Medical Association study and perhaps endorse them.

Apparently it has not been clearly enough understood by many readers of this pamphlet that Major Jukes' resolution was never accepted by the Vancouver Medical Association. A committee was appointed to study it, but no report has yet been made.

The Vancouver Medical Association states categorically that it "has never advocated, nor will it advocate, any policy which is not in uniformity with the decisions and majority opinions of (*a*) the British Columbia Medical Association, which represents the whole profession of British Columbia in medical matters, economic and political, and (*b*) the Canadian Medical Association, which similarly represents the Canadian profession as a whole.

"In this matter the prime consideration is that the medical profession of Canada should work and express its views as a whole, and through a single voice, that of the Canadian Medical Association. The Vancouver Association is heartily in accord with this principle and policy, and will not deviate from it."

The Use of Soda in Cooking

The housewife knows that if she adds sodium bicarbonate to green vegetables the cooking time is shortened and the green colour is intensified, particularly in the case of peas. But there must be few housewives who have not had it impressed on them of recent years that this shortcut is apt to destroy the vitamin content of the food. For practical purposes perhaps it will be as

well if this general conclusion remains as it is, but actually it is not entirely accurate.

Comparative studies have been made* on the effect of cooking with and without sodium bicarbonate. In the first place there is no doubt that the bicarbonate definitely reduces the boiling time of peas by less than half in the case of fresh peas and from six to four minutes with frozen peas. Secondly, the amount of vitamin loss largely depends on the method by which the peas have been preserved. With fresh peas and those frozen by the tunnel-freezing process there was practically no loss of vitamins with the use of soda. But when prepared by the plate-freezing process the cell membranes of the peas are apparently damaged, and the loss of thiamin even without soda, is considerable. With soda the loss increases even more.

As regards riboflavin the presence or absence of soda in the cooking had no demonstrable effect on the amount lost in cooking. With ascorbic acid also the alkali had no special effect.

The warning therefore is given that the addition of soda is undesirable unless very carefully safeguarded. One other undesirable feature is that the average housewife is apt to add an excess of soda rather than an accurately measured quantity.

Medical Economics

POLITICS AND MEDICINE

[*The Provincial elections in Saskatchewan are now a matter of history, and in any case we are not directly concerned with them. They served however to bring out an aspect of politics which touches the medical profession very closely. This is the tendency of political speakers, whether, from ignorance or otherwise, to misrepresent facts regarding the methods and results in the medical care of the people. In this case it was the C.C.F. who offended, and we print below the detailed rejoinder made by Dr. J. F. C. Anderson on behalf of the College of Physicians and Surgeons of Saskatchewan.*—EDITOR.]

"Statements regarding health and medical services in Saskatchewan made by the C.C.F. in their large advertisements in the *Star-Phoenix*, Saturday, June 10, and by their leaders either display inexcusable ignorance or are deliberate mis-representations of the facts for political purposes.

"The medical profession in this Province has no desire to intervene in party politics. But when one party makes statements to the public which cast reflection upon and totally misrepresent the results of medical care and treatment as at present organized and, further, deliberately misrepresent the proposed health insurance legislation which the medical associations have approved in principle we then feel it is our duty to place the correct facts before the public.

"The C.C.F. stated that 'the death rate for babies in Saskatchewan is more than twice as high as it needs to be'. Rev. T. C. Douglas, May 20, 1944, in Regina went on to say 'our death rate for infants is 65 for every 1,000.' Whereas in truth in 1942 it was only 43 compared to a Dominion rate of 54. This is a reduction from a Dominion rate of 63 in 1938 in spite of the absence of 30% of the doctors on active service.

"The C.C.F. states that 'one mother out of three who dies at childbirth in this Province could be saved—over one-quarter of childbirths in this Province are not attended by a doctor.' To quote the minister of public health from the Regina *Leader Post* on March 8, he states 'not since 1934 have 25% of the births in the Province been unattended by doctors. Each year the percentage has been dropping and the latest figure available shows that only 16.16% of the births were unattended by doctors and over 60% of all babies born are born in hospitals. As a matter of fact Saskatchewan is the third lowest Province in the Dominion with regard to maternal mortality.' He further pointed out that during the period between 1936 and 1940 Saskatchewan had the lowest mortality rate in Canada. The maternal death rate for cases conducted in Saskatchewan hospitals was at the very low figure of 2.3. The C.C.F. asserts 'thousands of people are going without medical treatment which they urgently need because they cannot afford it.' The medical profession deplores that many cases of illness may not have consulted a doctor because of financial reasons or remoteness of the patients from their nearest doctor but we emphatically assert that very few if any cases of real urgency have been unable to obtain treatment because of inability to pay.

"The C.C.F. say that 'preventive medicine is almost completely neglected. The result is an incredible amount of avoidable sickness, with all its consequent pain, economic waste, destitution and premature death.' The general rate for Saskatchewan of 6.8 per 1,000 in 1942, which is the lowest in the Dominion, is ample evidence of the fact that Saskatchewan is second to no other Province in preventive as well as curative medical services. The Saskatchewan public health department has developed an enviable record in respect to preventive medicine. It must be pointed out that preventive medical services are being practised day by day by practically all medical men. Large quantities of sera and vaccine have been made available to town and rural doctors for the protection of the people of the Province. Arsenicals have been made available for the treatment of syphilis. It is the hope of the medical profession that further public health organization with disease prevention methods may be extended to the rural areas of the Province.

"The C.C.F. statements on health insurance are equally misleading. They state that 'it only covers those who can afford to pay the insurance

* *Nutrition Reviews*, 1944, **2**: 72.

premiums'. The fact is that the proposed Dominion Insurance Bill most emphatically provides that every person below the income level chosen by the Province must be covered and that the premiums of those unable to pay themselves are to be paid by the state. The C.C.F. also states 'there are not enough doctors for health insurance.' They deliberately neglect to mention that this shortage is in large part due to the enlistment of over 30% of the doctors of this Province. It is further asserted 'our doctors in rural areas have not the equipment for diagnosis and treatment,' whereas rural doctors now have better equipment than in any time in medical history. Further they state, 'that health insurance is not enough because it does not provide adequate facilities for preventive medicine. It does not promote research and clinical study to prevent disease'. Nothing could be further from the truth. These facilities are all specifically provided for in the proposed health insurance bills.

MISREPRESENTATION

"The C.C.F. also state 'the Government is not bringing it (health insurance) in. This is a decided misrepresentation. They arrive at this from a statement of Prime Minister Mackenzie King's that no bill which has been before the Social Security Committee has been even submitted to the Government up to the present time' (March 3, 1944). Copies of the proposed health insurance bill are available to anyone from the King's Printer under date of March 8, 1944. It is this draft bill which is as yet under consideration by the social security committee. The Dominion Government, recognizing the vast importance of health, has very carefully avoided making health insurance a political football by having its Department of National Health draft a proposed bill for study, alteration and approval by a select committee of the House of Commons composed of members of all political parties so that when it finally comes before the House it may as far as possible be acceptable to all political parties. The report of this committee is nearing conclusion and a definite undertaking has been made that this bill as amended would be presented to the House of Commons.

"The medical profession of this Province are very much in favour of and willing to co-operate fully in any sane measures to increase the standard of health services of all kinds and to make them available as freely as possible to every member of the community. As long as two years ago the profession in this Province publicly expressed their approval of state aided health insurance which we believe is the best proposal so far made."

Men and Books

CATECHISM IN MEDICAL HISTORY

By Heber C. Jamieson, M.D., F.R.C.P.(C)

Edmonton

QUESTIONS

1. Whence arose the saying "cool as a cucumber"?
2. What French physician, after writing an immortal work on the lungs, by an irony of fate has his name attached in medical terminology to the disease of another organ of which he wrote only a short description?
3. In the olden days of Medicine, poetry was frequently used to give medical advice. Poetic descriptions of medical situations were also common. Do you know of an early poetic one on Cæsarean section?
4. What was the "iliac passion" and in what book was it first described?
5. What medical practice of the twentieth century hospital had its origin among primitive races when malignant spirits were believed to be the cause of disease?
6. Under what circumstances did a woman once hold the Chair of Anatomy at Bologna?
7. What was the "doctrine of the infarctus"?

ANSWERS

1. In mediæval Medicine with its humoral theory, disease was due to imbalance of the four elements or their qualities, hot, dry, cold and moist. If it was decided that the patient was hot and moist cucumber seed might be given because the astrologer-herbalists believed that plants were heating or cooling and in different degrees. Cucumber was cool in the fourth degree.
2. Laennec. Laennec's cirrhosis of the liver (hobnail liver). Curiously, the account of this condition appeared in a brief report on chronic pleurisy. He proposed the name "cirrhosis" from the Greek for yellow, in 1826.
3. A Persian poet of A.D. 999 wrote:
   "His birth could not be natural;
   So willeth He who bringeth good. Bring thou
   A blue steel dagger, seek a cunning man;
   Bemuse the lady first with wine to ease
   Her pain and fear; then let him ply his craft
   And take the lion from his lair by piercing
   Her waist while all unconscious, then imbruing
   Her side in blood, stitch up the gash".
4. Appendicitis. Jean Fernel (1497-1558) wrote "the first medical work to be called a textbook of Pathology". The first clear account of the symptoms and post mortem findings of appendicitis are set forth. Fernel was one of the first to attribute aneurysm to syphilis.

5. The use of *red* flannel bandages on the joints in rheumatic fever. The ancient Chinese, like the aborigines of New Zealand today, regarded the colour red as hostile to evil spirits and a red ribbon necklace, or ring was worn as a defence against disease.
6. About the middle of the eighteenth century Jean Manzolini, a painter, and his wife Anna made wax anatomical models for the Pope. The wife excelled her husband in this work and was given the Chair of Anatomy in order that she might lecture in the University.
7. Johann Kamph (1726-1787) taught that nearly all ills were due to fæcal impaction. As a remedy he advocated the clyster (enema). This practice became fashionable and was carried to such an excess that it became a popular subject for cartoonists and for stage jokes.

Divisions of the Association

Ontario Division

COMPARATIVE STATEMENT *Re* MEMBERSHIP
JUNE 26, 1943 and JUNE 15, 1944
(MEMBERSHIP INCLUDES C.M.A. MEMBERSHIP)

District	*County*	*Active medical population 1944*	*Members 1943*	*1943*	*1944*	*1944*
				%		%
No. 1	Essex	145	105	71	111	76
	Elgin	34	26	84	26	76
	Kent	47	40	77	40	85
	Lambton	33	29	83	33	100
	Middlesex	24	...	...	20	83
	London	146	...	...	101	69
		170	112	55	121	71
		429	312	66	331	77
No. 2	Brant	42	37	71	39	93
	Oxford	47	36	72	38	81
	Perth	29	23	92	26	90
	Norfolk	17	13	76	14	82
	Wellington	44	32	72	32	73
	N. Waterloo	50	46	85	45	90
	S. Waterloo	28	20	71	23	82
	Huron	27	22	68	21	77
		284	229	77	238	84
No. 3	Bruce	26	20	71	18	65
	Grey	31	27	75	27	87
	Dufferin	8	8	100	8	100
		65	55	76	53	81
No. 4	Haldimand	19	14	73	15	79
	Lincoln	52	38	70	36	69
	Welland	60	53	88	48	80
	Wentworth	203	164	74	164	81
	Halton	21	19	82	19	90
		355	288	76	282	79
No. 5	Simcoe	64	39	58	50	78
	Peel	19	12	79	12	63
	York	44*	44	55	34	77
	Ontario	61	34	54	36	59
		188	129	57	132	70
No. 6	Victoria and Haliburton	20	13	65	18	90
	Peterborough	41	33	84	34	83
	Durham	19	16	69	17	84
	Northumberland	22	16	66	15	68
	Hastings	45	27	62	32	71
	Prince Edward	12	7	58	9	75
		159	112	69	125	79
No. 7	Frontenac	79	52	58	56	71
	Leeds	28	21	70	22	79
	Grenville	11	8	61	9	82
	Lennox and Addington	12	9	75	12	100
		130	90	62	99	76
No. 8	Carleton	237	162	69	170	71
	Stormont	29	20	71	21	72
	Glengarry	11	10	100	9	82
	Prescott	17	14	74	13	88
	Renfrew	28	22	73	20	71
	Russell	7	6	67	5	71
	Dundas	10	8	80	9	90
	Lanark	27	17	61	18	67
		366	259	70	265	72
No. 9	Algoma and Manitoulin	39	30	73	34	87
	Sudbury	62	37	66	47	76
	Kirkland Lake	15	12	85	13	87
	Temiskaming	12	11	69	11	92
	Cochrane	51	41	79	45	88
	Muskoka	14	25	71	14	100
	Nipissing	26	24	80	22	85
	Parry Sound	16	...	...	13	81
		235	180	74	199	84
No. 10	Kenora	16	12	75	15	94
	Rainy River	8	7	88	7	89
	Thunder Bay	66	51	73	51	78
		90	70	74	73	81
No. 11	Toronto	1,088	609	53	712	65
	Total	3,389	2,333	64	2,509	74

*In 1942 Toronto Postal districts Nos. 14 and 15 were counted in percentage of York.

Paid up members, not in practice	32
Paid up members, deceased	3
Paid up members, on military service	2
Paid up members, addresses unknown	1
Part payment members	1
Members at large	2
Complete number paid members	2,550

Medical population as tabulated in this statement, represents active practitioners only.

Medical Societies

Calgary Medical Society

At the annual meeting of the Calgary Medical Society held on April 10, the following officers were elected for the 1944-1945 session: *President*—Dr. J. K. Mulloy; *Vice-president*—Dr. H. S. McLeod; *Secretary*—Dr. A. E. Wilson; *Treasurer*—Dr. J. V. Follett; *Librarian*—Dr. R. R. Hughes; *Executive Committee*—Drs. H. V. Morgan, R. W. Culver and G. P. Wilcock.

North East Saskatchewan District Medical Society

North East Saskatchewan District Medical Society met on June 14 at Queen Victoria Hospital in Yorkton. The program included a motion picture on "Caudal anæsthesia in obstetrics" and a report of 50 cases of caudal anæsthesia in private practice by Dr. H. A. L. Portnuff, of Yorkton, also the annual business meeting and election of officers for the coming term.

Prince Albert District Medical Society

During the month of May, District Medical Society meetings were held at Prince Albert, the guest speaker being Mr. H. J. Fraser, M.L.A.; at Melville Dr. E. D. Winchell of the Weyburn Mental Hospital spoke on "Psychiatric problems" and Dr. C. J. Houston gave the latest report on "Progress of health insurance legislation to date"; at Regina nominations were made and reports of committees given, Lt.-Col. Groff, D.M.O. for M.D. No. 12 was guest speaker; and at Saskatoon several meetings have been held for discussion of the new Health Insurance and Cancer Bills.

The June meeting was held on June 6 at the Sanatorium. It took the form of a luncheon meeting at 6.30 p.m.

Vancouver Medical Association

The Vancouver Medical Association held one of its most successful Summer Schools from June 20 to 23 inclusive. All meetings were held in the Hotel Vancouver. The level of papers read was very high, and there is no doubt that this particular Summer School represents considerable achievement, especially as it is very difficult under war-time conditions to obtain speakers at all. The list of speakers at this School, which was previously published, shows that the Committee in charge was able to obtain men of very high calibre indeed. The guest speaker at the luncheon given on June 20 was Surgeon-Captain C. H. Best, who spoke on "Medical research in war-time".

There were 341 registrations, of whom 125 were in the various Services. All meetings were well attended. A golf tournament was held on Thursday, June 22, at the Capilano Golf Club, one of the most beautiful golf courses in Canada.

La société médicale des hôpitaux universitaires de Québec

Séance à l'Hôpital du Saint-Sacrement tenue vendredi, 28 avril 1944, à 8 h. 30 du soir.

MONONUCLÉOSE INFECTIEUSE.—Drs Kelly et J. Edouard Morin.

Les auteurs rapportent l'observation d'un jeune aviateur qui a présenté au début de décembre, un syndrôme infectieux, caractérisé par des malaises généraux; maux de tête, courbature, température, une angine légère et un gonflement ganglionnaire dans la région de l'angle du maxillaire gauche. Au neuvième jour de la maladie, une adénite bilatérale, cervicale, inguinale, et maxillaire.

La recherche des anticorps hétérophiles dans le sang du malade (d'après la technique de Paul et Bunnell modifiée par Davidson), a donné une séro-agglutination positive jusqu'au 7/1000. Dix jours plus tard, la même réaction dut de nouveau pratiquée, et on obtint une agglutination du 3/1000. Une épreuve de contrôle pour éliminer les antigènes de Forssman a fourni une réaction négative pour ces antigènes.

Au début de l'infection, la formule sanguine révélait une leucocytose de 15,400. Le décompte cellulaire indique une mononucléose de 80%. Douze jours plus tard, la leucocytose est tombée à 9,000 donnant une mononucléose de 74%. Le malade a guéri très rapidement de son infection, et un mois plus tard, tous les ganglions étaient revenus à la normale. Cette observation est la première signalée dans la région.

EPITHÉLIOMA DU BASSINET.—Dr Nérée Lavergne.

Après avoir fait une revue de l'anatomo-pathologie de la symptomatologie et du diagnostic des tumeurs du bassinet tant bénignes que malaignes, l'auteur rapporte un cas d'épithélioma du bassinet observé chez une femme de 68 ans, dont le diagnostic a pu être établi nettement par une pyélographie rétrograde.

L'auteur insiste surtout sur le diagnostic radiologique qui repose, d'après lui, sur deux signes caractéristiques:

1° Une image de soustraction qui, dans le cas présenté, réalisait une amputation totale du bassinet;

2° Une image particulière représentée par une ligne semi-circulaire à concavité supérieure, qu'il appelle "le signe de la cupule" et qui provient du moulage opaque de la partie de la tumeur qui fait saillie dans la cavité pyélique.

Il aurait d'ailleurs observé ce signe de la cupule à peu près constamment sur les pyélogrammes des tumeurs rénales et il tend à lui accorder une valeur diagnostique considérable.

PLEURÉSIES PURULENTES.—Drs F. Trempe, J.-P. Roger et J. M. Lemieux.

Il s'agit des pleurésies purulentes observées à l'Hôpital du Saint-Sacrement de 1934 à 1944. 74 pleurésies sont données avec l'âge, le microbe, l'intervention chirurgicale si elle a été pratiquée, le nombre de jours d'hospitalisation et le résultat.

Sur ces 74, 56 ont guéri et 18 sont morts. 61 ont été livrés à la chirurgie, sur ce nombre 51 ont guéri et 10 soit environ 16% sont morts.

La durée moyenne d'hospitalisation a été de 69 jours. Aucun des malades n'est passé à la chronicité.

Les causes de nort ont été suivantes: (1) le jeune âge ou l'âge avancé, (2) la cachexie et la débilité, (3) la malignité du microbe et en premier lieu les gangréneux, (4) la bilatéralité des lésions.

La publication se termine sur des considérations générales.

UNE TROISIÈME MALADIE VÉNÉRIENNE À QUÉBEC?

Un cas de chancre mou.—Drs Sylvio Leblond et J. A. Samson.

L'Officier Commandant de l'Hôpital Militaire de Valcartier, P.Q., a porté à l'attention de la profession médicale de la Ville de Québec, au cours du mois d'avril, un cas de chancrelle, le premier à être reconnu dans cette région.

Le soldat en cause, quatre jours après un rapport sexuel extra marital, a présenté une ulcération du sillon balano-préputial, qui cliniquement avait plutôt l'apparence d'une gangrène aiguë. La syphilis fut éliminée par des examens ultra microscopiques répétés (soit 10) et des Wassermans du sang (soit 9) obstinément négatifs. L'application locale de sérum anti gangréneux ne donna pas les résultats attendus. Le diagnostic fut basé, d'une part sur l'allure clinique de l'ulcération, sur le développement d'un bubon dans l'aisne droite et sur le caractère excessivement douloureux du syndrôme; d'autre part, par la mise en évidence d'un diplo-bacille, gram-neg. en navette dans le pus de l'ulcération, et sur la positivité incontestable d'une réaction d'Ito-Reenstierna. L'auto inoculation n'a pas donné de renseignements. La culture du pus retiré du bubon par ponction a permis l'élaboration du diagnostic microbiologique; cependant la culture n'a pas survécu. Le traitement a consisté en une dose de totale de 61 gms. de sulfathiazole en 11 jours. Quarante-huit jours après le début du traitement, le symptôme douteux avait complètement disparu. Les points fistuleux, consécutifs aux ponctions ganglionnaires se sont asséchés à la 5e journée. La cicatrisation de l'ulcération génitale s'est complétée à la 9e journée. Une prise de sang faite le jour du licenciement était négative.

Correspondence

Conservation of Paper

To the Editor:

Since the establishment of this Division, under the direction of Minister National War Services, for the control of printing, stationery, publications and other office supplies in all permanent Departments of Government, very considerable success has been attained in the conservation of paper. With the fullest co-operation of departments printing requirements have been curtailed: size and quality of letterheads and forms reduced: mailing lists also have been trimmed and greater use is being made of used envelopes by means of stickers, etc.

However, from time to time in the press there has been criticism of Government Departments for what was considered wasteful and extravagant use of paper, especially at a time when economy in the use of paper is vital.

Undoubtedly there has been, and still may be a wasteful use of paper. Therefore, I would appreciate being advised of any examples of such waste which may come to the attention of members of your Association, and would appreciate your co-operation in so advising them.

T. P. MURPHY,
Acting Director, National War Services, Government Office Economies Control.

Special Correspondence

The London Letter

(From our own correspondent)

HEALTH SERVICES

No further major steps have been taken with regard to the proposed National Health Service and it is expected that the postponement of the Annual Representative Meeting of the British Medical Association will lead to some delay. Meanwhile, the correspondence columns of *The Times* have been opened to quite a lively exchange of views.

Certain more sectional interests have, however, got down to some detailed planning and, of these, the most important to be reported this month is concerned with the National Maternity Service, proposals for which have been drawn up by a committee of the Royal College of Obstetricians and Gynecologists. It is asserted that better obstetrical skill supported by first-rate institutions and equipment must be the main basis of a National Service. It aims at a regional organization with areas covering a population of about one million, with a key centre of university status. There would then be divisional centres in towns and rural areas and local centres in country towns and villages. The general service would be controlled by the Minister of Health as part of the general Health Service of the country and he would be advised by a special committee of the Central Council proposed in the White Paper.

Throughout the new scheme runs a strong plea for closer collaboration between the obstetrician and the pædiatrician, and provided that the personnel can be well-trained, the whole scheme has the shape of a most important contribution to the nation's welfare.

Another set of proposals deals with a National Pathological Service. Here again is found the key centre as a university department and a division into three main branches, namely:—teaching and research, clinical pathology, and public health bacteriology. Various arrangements for detailed organization within the areas covered are described and it is particularly hoped that the head officer shall be appointed after consultation with the pathologists of the region which he is going to supervise. Little was said in the government's proposals about the organization of a pathological service and much has been learned during the war about the quite inadequate provisions now available in many parts of the country.

MORE ABOUT MILK

The improvement of the nation's milk supply continues steadily although the most recent contribution has been criticized from the medical side. This consisted of a new act of Parliament which will transfer to the Minister

of Agriculture the general control of the health of the cows. There will be a regular veterinary inspection and definite steps for securing that the buildings and so forth on the farm are kept up to a high quality. Local health authorities are thus losing some of their powers but they will retain their responsibility for the control of any disease in humans likely to be of bovine origin.

A storm blew up in Parliament on the alleged autocratic powers which the Minister of Agriculture was going to obtain by the Act and the controversy does raise the interesting point as to whether the provision of safe milk justifies a stricter interference with the liberty of the farmer. However, the National Farmer's Union is in favour of the new bill although, as already said, the medical profession seems to be against it. This last stand is because the bill really misses the point of safety while stressing the point of cleanliness, and all along the doctors have been dissatisfied with the grade known as "accredited" which is apparently going to continue. However, there has been a substantial increase in the amount of milk drunk by the nation and in part this explains a distinct betterment in the teeth of London's school children just recently reported.

SICKNESS RECORDS

It is rather curious that at a time when an elaborate national medical service is being planned, no one really knows much in detail about the amount of illness in the country. Mortality statistics do not of course tell anything like the whole story, but there are signs of some more precise information on the non-killing diseases. Field workers of the War-time Social Survey are now carrying out a system of interviewing a random sample of the civilian population in all parts of Great Britain between the ages of sixteen and sixty-five. Everyone is asked to record from memory all illnesses and injuries of the preceding three months. It is hoped to build up a monthly sample of two thousand five hundred, and also to correlate findings with various social factors.

Certain preliminary notes issued by Dr. Percy Stocks in the monthly bulletin of the Ministry of Health reveal some interesting figures. For example, about 70% of all those interviewed had had some sort of ailment during the previous three months. The incidence of serious illness was only 2% each month and obviously it is the minor ailments which help to make up the larger figure. However, 10% had been laid up for at least one day in December for upper respiratory illness. Another interesting point concerns the number of visits to and by doctors. These amount to approximately 2% per sick person. Well over half were at the doctor's house and over a quarter in the patient's own home. Many other interesting points appear in these surveys and it is proposed to mention them in this letter from time to time.

ALAN MONCRIEFF.

London, July, 1944.

University Notes

University of Manitoba

Mr. Justice H. A. Bergman, Chairman of the Board of Governors of Manitoba University, has issued a formal statement on the policy of the university in regard to admittance to the medical course. The following conclusions have been reached by the board:

High standards of medical education established by the university must be maintained, never lowered, and raised if possible.

Facilities for hospital training—an essential part of the maintenance of these standards—are now taxed almost to the limit.

Clinical material available in the hospitals is barely sufficient to supply the needs of the present number of students in medicine, and the prospects are decidedly against any increase in that material.

The university would not, because of these basic limitations, be justified in enlarging either its staff or equipment.

It follows that only a limited number of applicants for admission to first year medicine can be accommodated and that selection must be made of those to be admitted.

Basis of selection has been established:

1. The university does not undertake to accept all applicants who have fulfilled examination requirements;

2. Preference will be given to applicants resident in Manitoba and to applicants who are graduates or undergraduates in the university;

3. Selection shall be based on scholarship, intelligence, character, fitness and the respective claims of all qualified applicants in the benefit of the course leading to the M.D. degree.

ROSS MITCHELL.

Common milkweed plants, long regarded as a farm weed pest, are now furnishing floss for lifebelts, marine mattresses, and for heat and sound insulation.

Canadian Medical War Services

MEDICAL OFFICERS APPOINTED TO THE R.C.A.M.C.—ACTIVE FORCE MAY, 1944

(Previous sections appeared in the February, March, May, July, September, November and December 1943, and January, February, March, May, June and July, 1944, issues)

SECTION XXVI

Name	Address	Date of Appointment
Barton, H. G.,	Schreiber, Ont.	16-4-44
Boyd, D. M.,	Victoria, B.C.	1-5-44
Croskery, W. H. R.,	Ottawa	16-4-44
Davis, F. H.,	Vancouver	1-5-44
Floren, S. A.,	Hamilton, Ont.	10-2-44
Goldenberg, H.,	Toronto	1-5-44
Gordon, A. S. P.,	Ottawa	16-4-44
Hall, D. H. M.,	Kingston, Ont.	16-4-44
Henderson, W. E.,	Holland Centre, Ont.	1-5-44
Hitsman, J. S.,	Kingston, Ont.	16-4-44
Kenny, P. N.,	Chatham, Ont.	1-5-44
King, F. G. E.,	Brantford, Ont.	1-5-44
Leach, J. E. K.,	Manotick, Ont.	16-4-44
Leung, S. W.,	Vancouver	1-5-44
Luborsky, B.,	Walkerville, Ont.	10-4-44
MacKenzie, J. M.,	Vancouver	1-4-44
O'Meara, M. W. H.,	Lethbridge, Alta.	5-5-44
Paul, E. B.,	Odessa, Ont.	16-4-44
Pidutti, J. A.,	Portsmouth, Ont.	16-4-44
Reich, C. J.,	Prince Rupert, B.C.	1-4-44
Shaver, E. M.,	Kingston, Ont.	1-5-44
Stone, E. L.,	Ottawa. This Officer was S.O.S. in error on report in March, 1944.	
Teevens, W. P.,	Pembroke, Ont.	22-4-44
Townsend, M. P.,	Toronto	24-4-44
Townsley, B. R.,	Ingersoll, Ont.	21-4-44
Vipond, C. H.,	Kingston, Ont.	16-4-44
Younghusband, O. Z.,	Kingston, Ont.	16-4-44

MEDICAL OFFICERS STRUCK OFF STRENGTH OF THE R.C.A.M.C.—ACTIVE FORCE MAY, 1944

Name	Address	Date struck off strength
Anderson, C. E.,	Brooks P.O., Alta.	17-5-44
Angelle, E. P.,	Deer Lodge, Man.	24-4-44
Beckwith, C. J. W.,	Sydney, N.S.	
Couchman, L. C.,	Salem, U.S.A.	8-5-44
Fugere, P.,	Quebec	26-4-44
Gordon, M. K.		17-4-44
McKenzie, H.,	Nanton, Alta.	15-4-44
MacRae, A. L.,	Sawyerville, Que.	20-4-44
O'Callaghan, R. H. L.,	Ganges, B.C.	27-4-44
Roberts, C. A.		2-5-44
Sunderland, K. B.,	Toronto	10-4-44
Taube, H. N.,	Toronto	1-5-44
Tidey, V. L.,	Hamilton, Ont.	30-3-44

Abstracts from Current Literature

Medicine

The Use of Refrigeration in Amputations and Peripheral Vascular Disease. O'Neil, E. E.: *New Eng. J. Med.*, 1944, **230**: 209.

Lowering of temperature slows the metabolism of tissues to a marked degree. Extremities of animals, which are deprived of blood supply by the use of a tourniquet, will survive for a much longer period if refrigerated, and the occurrence of shock, thrombosis, and injury to blood vessels and nerves, is markedly inhibited.

Refrigeration anæsthesia is particularly indicated in poor-risk patients, especially when first seen in an advanced state of peripheral arterial insufficiency, often with rapidly spreading gangrene and sepsis. The usual operative mortality in this group is appallingly high with ordinary methods of anæsthesia and the added operative shock. Refrigeration anæsthesia has little to offer in the case of good-risk patients.

The method of the author was ligation of the limb (by tourniquet) with refrigeration. The tourniquet should be narrow (rubber tubing 10 to 12 mm. in diameter) and applied as tightly as possible. The limb is immediately surrounded with cracked ice enclosed in rubber sheeting or in a special container built for the purpose. The object is to chill without freezing by maintaining a skin temperature of 8 to 10 degrees Centigrade, and anæsthesia sufficient for a painless operation is obtained in two to two and a half hours. The tourniquet causes no damage when the limb is refrigerated and has remained on for 10 to 12 hours in many cases.

Once the desired degree of anæsthesia is obtained the patient is moved, with the ice container, to the operating room, the box removed and the limb prepared. The incision is made 10 to 15 cm. below the tourniquet, the type of amputation should be of the simplest and without drainage. The tourniquet is released just prior to wound closure.

Refrigeration amputations are free of pain and shock, there is no change in pulse or blood pressure and no postoperative discomfort. Gradual removal of ice bags from around the stumps is important to assure gradual rise of tissue temperature. Any evidence of sloughing or infection calls for reduction in temperature. Wound healing is excellent but slower than in non-refrigerated stumps and sutures should be left 15 to 20 days.

The above method was carried out in 54 patients, 4 of whom were moribund on admission and died before operation. Of the remaining 50 patients 16 died (32%) but deaths were not operative and all but two were due to cerebral vascular accidents, cardiac failure, and pulmonary embolism. The other two fatalities occurred early in the series from gas bacillus infection of the stump and all subsequent cases received prophylactic polyvalent serum.

In a more recent study of 33 consecutive cases the mortality was only 12%. In the ten-year period previous to the cases where refrigeration was employed the mortality rate was 53% in similar cases operated upon

and, in addition, 162 cases were too critical for operation under the usual methods of anæsthesia.

The principle of refrigeration, without ligation, is now used in all cases of peripheral circulatory insufficiency which have not progressed to the point where loss of the limb is imminent. It is also considered a valuable adjunct in the treatment of various injuries and burns, especially under conditions of active warfare.

NORMAN S. SKINNER

Geriatrics; the Medical Care of the Elderly. Lee, R. I.: *New Eng. J. Med.*, 1944, **230:** 190.

The marked increase in life expectancy, which has been the result of the rapid advance of medicine and public health, is due to improvement of mortality in the early age group. The man of forty to sixty-five lives no longer than he did fifty years ago, and there is a certain amount of evidence that he is no healthier. Society has taken a negative and an entirely defeatist attitude towards old age, an attitude that must be changed if improvement in the health of the old age group is to be achieved.

Gallstones, diverticulosis and inflammations of the intestines all increase in frequency with age. Appendicitis, usually considered a disease of young people, again becomes common after the age of sixty and should always be considered as a possible cause of abdominal symptoms in the elderly.

The administration of the proper food in adequate quantity and quality is the most important factor in the maintenance of the health of the older person. Vitamins, especially the B complex group, are of the utmost importance and must be in ample supply. Roughage and fat in the diet are usually best restricted as they are often poorly tolerated.

With advance in age there is diminution in function and secretion throughout the body and the same is true for the digestive tract. The author feels that hydrochloric acid, pepsin, bile salts and even pancreatic extract are of value in the older person, although they are seldom effective in the younger age groups.

Thyroid therapy is often indicated and helpful. Non-diabetic glycosuria is frequent but may require no treatment. Testosterone has a place in geriatric medicine but must be used with due care. There are as yet no successful methods of combating arteriosclerosis or prostatic hypertrophy.

The psychological treatment of the older patient is vitally important and must be the concern of the family as well. If little interest is shown in the elderly patient unhappiness with resulting impairment in health, even the loss of will to live may result.

NORMAN S. SKINNER

Surgery

Lobectomy of the Liver. Pickrell, K. L. and Clay, R. C.: *Arch. Surg.*, 1944, **48:** 267.

While partial excisions of the liver have been reported on numerous occasions, only twice has the total extirpation of the left lobe of the liver been recorded. The authors review the records of three patients under their care, upon whom complete resection of the left lobe of the liver was performed for carcinoma, hæmangioma and gumma, respectively. All of these patients recovered from the operation. Resection of the liver has been performed for such diverse conditions as angioma, echinococcus cyst, gumma, tuberculoma, trauma, carcinoma, sarcoma, adenoma and hæmatoma. The two cardinal objections to resection of large segments of the liver, were the severe hæmorrhage entailed by transection of this vascular friable tissue which retains sutures so poorly, and the fear that the function of the liver subsequently would be impaired. Turner in 1923, largely ruled out the latter objection when he found the function perfectly normal after removal of an adenoma and a large adjacent mass of hepatic tissue weighing two pounds, three ounces.

The problem of hæmostasis in resection of the liver remains the major one. The authors describe the technique which they employed for a relatively bloodless resection of the entire left lobe of the liver.

G. E. LEARMONTH

The Determination and Treatment of Pressure Cavities in Pulmonary Tuberculosis. Vineberg, A. M. and Kunstler, W. E.: *Surg., Gyn. & Obst.*, 1944, **78:** 245.

In this extensive paper the authors have produced what will probably remain the standard monograph on the subject for a long time. The history of pulmonary cavity drainage is reviewed since Hippocrates' time. Indications, methods and results are described in full detail in relation to the authors' series of seventy cases.

Every tuberculous cavity in a lung which cannot be satisfactorily collapsed by pneumothorax should be needled if the cavity is over 2 cm. in diameter. The cavity is exactly localized by tomogram films; 42% of the cavities in the authors' series were demonstrated to be tension cavities. Air can enter such cavities more easily than it can escape, and the resulting tendency they have to keep themselves blown up is accepted to be the main cause of the well known failure of thoracoplasty to close a certain percentage of cavities.

All these tension cavities should be drained. The method of drainage is described in exact detail, with good photographic illustrations. Successful drainage is always followed by thoracoplasty to achieve permanent collapse of the cavity area.

Drainage of tuberculous cavities is an accepted procedure. This article places the procedure on a sound and rational basis. The element of guess work in choosing which cavities to drain has been eliminated.

J. R. LACROIX

Cancer du rectum. Coller, F. A. and Ransom K.: *Surg., Gyn. & Obst.*, 1944, **78:** 304.

Dans ce travail, les auteurs présentent une série de 571 cas de cancers du rectum et du recto-sigmoïde observés au cours d'une période de 6 ans et ½. Le malade le plus âgé avait 82 ans, le plus jeune 22. Le diagnostic a été établi par les moyens d'examens habituels: exploration digitale ou manuelle, recto-sigmoïdoscopie, radiographies, biopsie, laparatomie exploratrice. Ils insistent sur l'importance de la biopsie, bien des polypes adénomateux présentant des possibilités de malignité qui dégénèrent par la suite en cancers, lorsqu'ils ne sont pas décélés assez tôt.

Tous les cas observés n'ayant pas été traités par la résection radicale, plusieurs ont reçu un traitement chirurgical palliatif ou un traitement conservateur. Ces traitements consistent en: radiumthérapie ou radiothérapie, excision des polypes, cæcostomies, colostomies, colostomies et radiothérapie combinées.

Les auteurs énumèrent les causes de morts opératoires survenues à la suite de colostomies: péritonites, infections pulmonaires, cachexie, accidents cardio-vasculaires, embolies pulmonaires, péritonites et embolies pulmonaires combinées, perforation du cæcum, obstruction intestinale, tuberculose pulmonaire.

Les auteurs ont pratiqué dans 285 cas des excisions radicales en un seul temps, généralement par résection abdomino-périnéale. Dans les cas compliqués par l'âge ou l'obésité, ils ont pratiqué la méthode de Mummery. Ils exposent en détails la technique de Miles suivie dans les 269 cas traités selon le premier procédé. Les principales complications survenues à la suite de ces interventions relèvent principalement du système pulmonaire et du système génito-urinaire.

D'après les auteurs la chirurgie demeure le principal traitement du cancer du rectum et du recto-sigmoïde, et la méthode en un temps qu'ils emploient augmentent les chances de guérison, sans accroissement notable de la mortalité opératoire.

PIERRE SMITH

Obstetrics and Gynæcology

Breech Presentation in the Elderly Primipara. Walsh, J. W. and Kuder, K.: *Am. J. Obst. & Gyn.*, 1944, **47:** 541.

The incidence of breech presentation in elderly primiparas is 6.76% as compared with 4.72%, the incidence of breech presentation in the clinic as a whole.

The incidence of toxæmia and myoma uteri is increased in the elderly primipara group, being 14.4 and 7.2%, respectively, as compared with 11.2 and 1.9% for the same complications in the total clinic cases. Premature rupture of the membranes occurred in 40% of the elderly primipara group, while in the clinic as a whole it occurred in 36.1% of the cases. There were two maternal deaths in this group of 55 elderly primiparas, giving an incidence of 3.6% for maternal mortality. The incidence of gross infantile mortality was 12.5%.

Cæsarean section is indicated in the elderly primipara with breech presentation, associated with any one of the following: large infant, contracted pelvis causing dystocia, myoma uteri, patient two weeks or more past term with a large infant, repeated spontaneous abortions or a history of sterility. ROSS MITCHELL

Hæmolytic Disease of the Newborn. Taylor, G. L. and Race, R. R.: *Brit. M. J.*, 1944, **1:** 288.

The findings reported prove that there is a marked preponderance of homozygous fathers in families affected by hæmolytic disease of the newborn; the homozygote appears to be about four or five times more dangerous than the heterozygote. This predominance of homozygotes affects enormously the chances of the Rh-negative, and therefore unaffected, children being born. The genotype of about three-quarters of Rh-positive people can be determined serologically, and unless it can be shown that the father is heterozygous in this way, or by his having an Rh-negative child or an Rh-negative parent, the prognosis is entirely unfavourable. ROSS MITCHELL

Myometrial Hypertrophy (so-called Fibrosis Uteri). Williams, J. T. and Kinney, T. D.: *Am. J. Obst. & Gyn.*, 1944, **47:** 380.

Ten cases are reported of a distinct clinical entity consisting of patients suffering from uterine bleeding associated with a symmetrically enlarged, thick-walled uterus with little or no endometrial hyperplasia. Evidence is presented that the increase in the size of the uterus is due to a hypertrophy of the muscle fibres of the myometrium.

Various theories concerning the etiology of this condition are discussed. It is suggested that this condition represents an œstrogen effect.

The name "myometrial hypertrophy" is suggested for this condition in lieu of the previous terms—fibrosis uteri, chronic metritis, arteriosclerosis, and metrorrhagia myopathia. ROSS MITCHELL

Erythroblastosis Fetalis in Identical Twins. Denny, N. G.: *Am. J. Obst. & Gyn.*, 1944, **47:** 554.

Inasmuch as erythroblastosis depends upon an inheritable trait, namely, the Rh antigen, both members of an identical twin pair would be expected to show it if one does. This was true in the twins reported by Denny. The mother who was 40, had four normal pregnancies resulting in living children. The fifth time, she gave birth to twins, one stillborn, the other died of hæmorrhage within four hours. Two years later she gave birth to a 16-pound child, stillborn. The seventh pregnancy resulted in identical twins, with single chorion and double amnion. Twin A, weighing 5½ lb., was jaundiced, had 321 normoblasts and 27 megaloblasts to 100 white blood cells. It was transfused many times with Rh negative blood, and was finally discharged on the 51st day. Twin B, weight 5 lb. 14 oz., had jaundice, 34 normoblasts to 100 white blood cells. The spleen and liver were not so enlarged as in Twin A. It was transfused with Rh negative blood and was discharged on the 15th day. Both twins had the disease, but the degree of severity differed in the two.

MADGE THURLOW MACKLIN

Pædiatrics

The Prophylactic Use of Sulfanilamide in Children with Inactive Rheumatic Fever. Dodge, K. G., Baldwin, J. S. and Weber, M. W.: *J. Pæd.*, 1944, **24:** 483.

This study was carried out in a young, susceptible group of ambulatory clinic patients from the lowest economic background. The study covered a period of four years. 88 children and adolescents with quiescent rheumatic disease were given from 1 to 2 gm. of sulfanilamide daily throughout the winter and spring months for a total of 181 patient-seasons. One hundred and one rheumatic children were observed as controls for 138 patient-seasons. The majority of cases in the treated group represented severe rheumatic disease. Toxic reactions from the use of the drug were minimal, and in no case did it have to be discontinued permanently. There was no evidence of sensitization or increased toxicity when the sulfanilamide administration was temporarily interrupted in any individual case.

During the period of study there were in the control group an incidence of 39% of Group A hæmolytic streptococcal infections as contrasted with 2.7% in the treated group. There were 19 definite major rheumatic relapses (with two deaths) and 7 mild or possible relapses in the control group. In the treated group only two children developed definite rheumatic relapses while taking the drug regularly. Two other children with recently active rheumatic fever showed signs of increasing rheumatic activity within two weeks of starting the drug. The authors prefer not starting the drug until two or three months have elapsed after all signs of active rheumatic infection have disappeared. They propose the use of sulfadiazine at the present time as the elimination is slower than sulfanilamide. The dose suggested is 0.5 gm. a day for small children and 1 gm. for larger children. The treatment should be continued until a child is well into adolescence or for five years after the onset of the disease. It is the author's opinion, based on this study and reports in the literature, that the effectiveness of sulfanilamide prophylaxis in quiescent rheumatic fever is established and that it should be applied more widely among groups of highly susceptible individuals. S. J. USHER

Oto-Rhino-Laryngology

Papillomatosis of the Larynx in Childhood. Ferguson, C. F. and Scott, H. W.: *New Eng. J. Med.*, 1944, **230:** 477.

Papillomas are the commonest laryngeal tumours in children and should always be considered in the differential diagnosis of chronic hoarseness. They tend to be multiple, to grow extremely rapidly, and to recur, and they carry the constant threat of glottic obstruction.

Fifteen cases of laryngeal papillomatosis were treated at the Children's Hospital in Boston during the ten-year period 1933 to 1942. The etiology is unknown. The duration of the disease is almost always self-limited, the average duration in the cases reviewed being three years, and, because of this fact, former radical operations which were usually employed in treatment, should be superseded by repeated, careful superficial excision.

Of the fifteen cases reported eight were complete cures with normal voice and larynx. Three patients are still under treatment and three died, two from asphyxia at home and one from laryngeal diphtheria. One case, discharged as cured at the age of twelve, returned at seventeen years of age with a recurrence.

NORMAN S. SKINNER

Acute Laryngotracheobronchitis: Treatment of the Œdema with Hypertonic Human Plasma. Baum, H. L.: *The Laryngoscope*, 1943, **53**: 371.

The cause of the laryngo-tracheobronchial obstruction is an inflammatory œdema in the subglottic tissues which extends throughout the mucosa of the tracheobronchial tract, with alteration of the secretions which become thicker and more adherent.

To avoid the hazards of tracheotomy, the author has found the intravenous administration of hypertonic human plasma effective against the œdema, but without any influence on the infection itself. It is the osmotic action of the hypertonic plasma protein introduced into the blood stream which reduces the œdema, by abstracting fluid from the tissues and seems to hold that fluid in the blood stream where it belongs.

If a considerable dosage of hypertonic plasma or serum must be given and if there is any circulatory embarrassment, it is desirable to withdraw the amount of blood equivalent to three or four times the quantity of plasma to be administered.

From 25 to 40 c.c. of the four times concentrated plasma solution is usually administered, depending on the size of the child and the severity of the case. No important reaction occurs, except the slight febrile reaction following any serum or plasma injection; so no preliminary skin testing is necessary. If subsequent injections are necessary, the cannula should be left in the vein, after an incision of the skin has been made.

When tracheotomy has already been performed, the intravenous treatment should be administered anyway; it may permit early decannulation and more effective bronchial drainage through the bronchoscope or the catheter.

Similar use of this method is applicable to: post-bronchoscopic obstructive traumatic œdema, vegetal foreign body reactions, supra- or subglottic obstructive laryngitis with œdema, angioneurotic œdema, œdema of the larynx from trauma; tracheo-bronchial œdema of any type, including crises of bronchial asthma.

V. LATRAVERSE

Orthopædics

The Use of Penicillin in the Navy. Barr, J. S.: *J. Bone & Joint Surg.*, 1944, **26**: 380.

This paper summarizes the experience in the American Navy with the use of penicillin in 1,976 cases between July, 1943, and January 1, 1944.

In all these cases no serious toxic reactions were found. The drug was administered intramuscularly, intravenously, locally and by duodenal tube, it being remembered that oral and rectal administration are ineffectual. Continuous intravenous or three hourly intramuscular therapy is recommended, with dosages of 60,000 units by the intravenous route, or 120,000 units by the intramuscular route. In mixed infections better results were sometimes obtained by using penicillin and the sulfonamides concurrently than by either alone. Repeated blood transfusions were found to be a valuable adjuvant. Further topical applications in saline compresses containing 250 units per c.c. of solution were of value in osteomyelitis and should be renewed in six to eight hours. The best results were obtained in sulfonamide resistant gonorrhœa, which showed 99% cures. Excellent results were obtained in infections caused by *Staph. aureus, Strep. hæmolyticus,* pneumococcus and meningococcus.

Fifty per cent of cases of osteomyelitis showed dramatic improvement. It was found that sequestra, bone plates or other foreign objects prevented penicillin from sterilizing a wound. Further it was concluded that adequate surgery was a necessity along with penicillin therapy in these cases to ensure good results.

H. F. MOSELEY

Radiology

The Treatment of Carcinoma of the Lung. A Symposium. *Brit. J. Radiol.*, 1944, **17**: 196.

J. L. Livingstone: My own experience has been that cases with bronchial obstruction and infection do not do well with radiotherapy, nor do I feel that the discomforts associated with intra-bronchial radon are worth the amelioration produced in the average case.

R. C. Brock: I would like to mention the intra-bronchial use of radon only to state that, in my experience, it has proved more harmful than useful in any but the rarest of cases, and I do not ordinarily recommend it even as a palliation. It is particularly likely to cause a fatal large hæmoptysis or a severe bronchopneumonia. For those patients judged suitable for it, radical surgery in the treatment of bronchial carcinoma has fully justified itself and holds out hope of permanent cure to a certain proportion, although small, of patients suffering from the disease.

Ffrangcon Roberts: Since I adopted small fields (4 cm. in diameter) there has been an unquestionable improvement in my results. Each field receives 1,200 r, the total skin dose can be 28,800 r or even higher.

J. L. Dobbie: Of treated patients, one-third was considered fit for radical treatment. Palliative treatment is of doubtful validity. Probably the exclusion altogether of late cases of proved carcinoma would be justifiable and preferable.

R. C. BURR

Correlation of Roentgenologic and Gastroscopic Examinations. Renshaw, R. J. F.: *Am. J. Roentgen.*, 1944, **51**: 585.

On the basis of our review of 938 gastroscopic examinations in 842 patients, we believe that gastroscopy has a definite but limited diagnostic value. Certain cases cannot be considered as having been adequately and properly studied unless a gastroscopic examination has been done. From the standpoint of the gastroenterologist, these include (1) cases in which the x-ray findings are negative, but in which upper gastrointestinal disease is still suspected; (2) cases with indeterminate or inconsistent x-ray findings; (3) gastric ulcer, especially while being treated; and (4) cancer, except in advanced, terminal, or obvious cases.

It was our experience that gastroscopy was of primary or major value in 25.6% of all cases examined. The primary value consisted of establishing a diagnosis which had not been made by other means or definitely making a diagnosis which by other means was indeterminate or incorrect. There were 17.7% with negative x-ray examinations in which gastroscopy revealed disease (140 cases of gastritis and 10 cases of ulcer). In 7.9% the roentgenologist suspected disease which was excluded by gastroscopic examination.

It was also our experience that gastroscopy was of no value in 19% of the cases. The chief cause of failure was the gastroscopist's inability to visualize certain areas where a lesion had been demonstrated or was suspected by the roentgenologist. Incorrect or misleading diagnoses constituted only 3.9% of all cases examined.

A comparison of roentgenologic and gastroscopic diagnoses in a series of proved diagnoses revealed that while the roentgenologic examination was still the most valuable single examination, the gastroscopist was no more likely to make the correct diagnosis or to err in judgment than the roentgenologist. Likewise, in the matter of differentiating between a malignant and benign lesion, the gastroscopist is not superior to the roentgenologist. In 60 instances of cancer or benign ulcer both examinations were in agreement in 27 cases. The gastroscopist was indeterminate or incorrect 13 times, the roentgenologist 12 times, and both were incorrect in 8 instances. Obviously, then, the proper procedure to follow when the roentgenologic and gastroscopic findings are not in agreement is further study and observation of the case, utilizing both "progress" roentgenologic and gastroscopic examinations.

R. C. BURR

Therapeutics

The Therapeutic Efficacy of Penicillin in Relapsing Fever Infections in Mice and Rats. Eagle, H., Magnuson, H. J. and Musselman, A. D.: *Pub. Health Rpts.*, 1944, **59**: 583.

In relapsing fever the tendency of spirochætes to disappear from peripheral blood even though the disease is still present makes a determination of cure difficult. In order to determine a cure in the laboratory animals used (white mice and white rats) the authors, in addition to the direct examination of blood, injected the blood of the experimental animals into normal animals. It was found in this way that a number of apparently cured animals were still infected and it is assumed that some of the animals, considered cured by direct blood examination and by injection of blood into normal animals, may nevertheless have harboured residual organisms. The following is the authors' summary of the results:

"The total dosage of penicillin which 'cured' 50% of white rats and mice infected with Borrelia novyi were 130,000 units and 100,000 units per kilogram respectively. Approximately 400,000 units per kilogram were necessary to cure more than 95% of the animals. This was half the dose which killed a significant proportion of the rats.

"If these results can be translated to man, they imply that the curative dose of penicillin in man would be of the order of 25,000,000 units. Unless relapsing fever is more amenable to treatment in man than it is in these experimental animals, or unless other strains of the organisms prove more susceptible to penicillin, the therapeutic use of the drug would not appear warranted except in arsenic-resistant cases, at least until such time as it is available in larger quantities."

FRANK G. PEDLEY

Pathology and Experimental Medicine

Fulminating Meningococcic Infection with Bilateral Massive Adrenal Hæmorrhage (the Waterhouse-Friderichsen Syndrome). Martland, H.: *Arch. Path.*, 1944, **37**: 2.

Nineteen cases of Waterhouse-Friderichsen syndrome are reviewed. Of these, 7 cases were correctly diagnosed during life and the correct diagnosis was suspected in 3 cases after death, but before autopsy. The remainder were diagnosed at postmortem examination. Of the cases under review, 9 patients were adults, indicating a relatively higher incidence among adults than the literature would indicate. The remainder were infants and children, 7 being under 6 years of age. The typical clinical picture is one of sudden headache, high fever, vomiting and restlessness in an apparent healthy individual. This is followed rapidly by an extreme cyanosis accompanied by petechiæ over the face, trunk, extremities and conjunctivæ. The skin petechiæ rapidly become larger and confluent to form first a macular purpura-like rash and finally a frank blotchiness. Death occurs usually within 8 to 24 hours, subsequent to the rapid onset of cardio-respiratory collapse, delirium, stupor, convulsions and coma. Good laboratory data are available in only 7 cases. Of these, all showed extreme leucocytosis. Six cases gave positive blood cultures of meningococci.

Characteristic postmortem findings in the series include marked cyanosis, petechial, purpuric and ecchymotic lesions of the skin, conjunctival petechiæ, petechiæ over the visceral peritoneum and pericardium, and bilateral massive adrenal hæmorrhages. This latter, together with the usual absence of gross meningitis, is most diagnostic. In only 3 of the cases was there any evidence of meningitis and in these cases the duration of the disease was over 36 hours. The author discusses the pathogenesis of the adrenal hæmorrhages, which, be it noted, are confined almost entirely to the cortex. He is of the opinion that the toxins liberated during the overwhelming meningococcæmia have a direct toxic effect on capillary endothelium, resulting in rupture of the capillary walls. The adrenal cortex, second only to the skin in the richness of its capillary bed, is predestined accordingly to bear the brunt of the damage. Death, however, Martland believes, is due to the meningococcic toxæmia rather than to acute adrenal insufficiency. The medico-legal importance of the syndrome in its relation to cases of sudden and unexpected death is obvious.

E. G. HINDS

Genesis of Encephalopathy Due to Arsphenamine. Scheinker, M.: *Arch. Path.*, 1944, **37**: 2.

The author reviews 5 cases of encephalopathy due to arsphenamine, in which certain vascular lesions in the brain were constant and uniform findings. These consisted in maximal distension and engorgement of the smaller veins and capillaries with blood and associated signs of stasis; degenerative changes or complete necrosis of the vessel wall with an increase of permeability for serous fluid and red blood cells; distension of the perivascular spaces with extravasated fluid and red blood cells. In the cases under study, minute punctate hæmorrhages were distributed chiefly in the white matter, especially in the corpus callosum and centrum semiovale. The hæmorrhages are described as being of two types (*a*) those filling the Virchow-Robin spaces and (*b*) so-called ring hæmorrhages in which the adjacent tissue is infiltrated with blood. Scheinker points out that similar findings have been reported in cases of post-traumatic œdema, massive hæmorrhage, and post-traumatic hæmorrhage infarction. In addition, certain non-hæmorrhagic lesions are disclosed in the nerve parenchyma adjacent to the blood vessels, *viz.*: areas of necrosis in direct proximity; circumscribed patches of dense cellular gliosis; small foci of rarefaction and œdema; devastated areas of the cortical ribbon in the proximity of capillaries together with hypertrophy and hyperplasia of the capillary endothelial cells; patches of demyelinization associated with circumscribed coagulation of the nerve parenchyma; small peri-capillary foci of necrosis each surrounded by a large ring of glial nuclei in palisade arrangement.

The author discusses various theories concerning the precipitating mechanism of both the hæmorrhagic and non-hæmorrhagic lesions and comes to the conclusion that all the histological alterations are to be ascribed to local circulatory disturbances. He is of the opinion that the primary central vasoparalysis may best be explained according to the classical theory of Cohnheim. In support of this, he points out that arsphenamine may act as a vasodilator and also as an agent producing increased capillary permeability. Finally, Scheinker suggests the term "encephalopathy due to arsphenamine" as being more appropriate than either "hæmorrhagic encephalitis" or "brain purpura".

E. G. HINDS

Failure of Dicumarol and Heparin to Modify Experimental Renal Infarction. Bollman, J. L.: *Proc. Staff Meet. Mayo Clinic*, 1944, **19**: 248.

In all animals studied no evidence was found to indicate that anticoagulant therapy had any influence on the size of renal infarcts produced by occlusion of a branch of the renal artery of rats.

It is of some interest that anti-coagulant therapy did not increase the size of the zone of hæmorrhage which was found at the periphery of the infarct.

These findings should not be interpreted as reflecting on the use of dicumarol or heparin in the prevention or treatment of thrombosis. There is ample evidence to indicate that anti-coagulant therapy will prevent the extension of thrombosis. This type of therapy will not enhance the blood supply of tissue after the blood vessels supplying it have been occluded.

S. R. TOWNSEND

Hygiene and Public Health

Venereal Disease Epidemiology Third Service Command, an Analysis of 4,641 Contact Reports. Norris, E. W., Doyle, A. F. and Iskrant, A. P.: *Am. J. Pub. Health*, 1943, **33**: 1065.

This paper analyses the results of contact tracing of venereal disease in the Third Service Command of the United States Army. For the purpose of contact tracing the U.S. Army has devised a form which is filled out in each new case and which calls for information on the contact, place of procurement and exposure, fee paid, if any, etc. This form, which ordinarily goes to civilian health authorities in the place where the exposure is said to have taken place, requests a report on the results of the investigation made; 4,641 contact forms are analyzed in this article.

Of the 4,641 forms sent to the civilian health authorities 62.7% were reported back to the army. These reports indicated that 43% of the returned forms and probably a higher percentage of the total, did not contain sufficient information to locate the alleged contact. Actually 475 contacts were investigated of which 258 were found to be infected; 64 of these 258 infected women were under treatment at the time of the investigation, 194 were not under treatment.

The analysis of the 4,641 forms as filled out indicated that prostitutes constituted only 20% of the contacts. The pick-up, to whom no fee was paid, was the leading named source of infection (64% white and 45% coloured soldiers). The leading places of encounter were cafes, restaurants and night clubs; the automobile was the most common place of exposure for white soldiers, the home and apartment for coloured soldiers. Hotels and rooming houses were also important places of exposure. Brothels constituted a rather small percentage of the named places of exposure.

FRANK G. PEDLEY

Recent Trends in Nutrition. McHenry, E. W.: *Canad. J. Pub. Health*, 1944, **35**: 154.

McHenry believes that it is time to take a critical look at the current opinions regarding nutrition. A number of surveys conducted in Canada have seemed to show that a very considerable proportion of the population was living on a deficient diet. This opinion has been arrived at by comparing the food record of a week of a number of families with that recommended as optimum by the Food and Nutrition Board of the United States and adopted by the Canadian Council on Nutrition. Two criticisms can be levelled at conclusions drawn from these two things. First, it may be questioned whether the dietary intake of one week can be considered properly representative of the average dietary intake and, secondly, the Recommended Allowances of the Food and Nutrition Board must be considered as optimum allowances and the conclusion is not justified that intakes below these levels constitute a deficient diet. To illustrate: 70 grams of protein a day are recommended, but there is reason to believe that an individual can carry on satisfactorily on 30 grams a day; 12 mgm. of iron a day are recommended, but it is well known that a man can remain healthy on almost no iron at all; 75 mgm. of ascorbic acid a day are recommended, but in England it is believed that people are doing quite well on as low as 30 mgm.

Some diagnostic procedures which have been used to detect subclinical dietray deficiencies have lately been questioned and actually discredited. A low content of ascorbic acid in the blood plasma may indicate merely a deficiency of ascorbic acid intake during the preceding few days, not pre-clinical deficiency. Vascularization of the cornea, which was thought to indicate riboflavin deficiency, is now not thought to be such a certain sign. The fact seems to be that subclinical deficiency of nearly anything is extremely difficult to demonstrate.

This paper is really a plea that health officers should assume leadership in nutrition and bring a balanced judgment to the problem which may have been exaggerated in recent years by enthusiasts.

FRANK G. PEDLEY

Industrial Medicine

Fluorides as an Industrial Health Problem. Largent, E. J.: Proc. Ind. Hyg. Found. of America, Inc. meeting, Pittsburgh, November, 1943.

There has been a great increase in the use of fluorspar and cryolite in industry. This has resulted in an increased health hazard from fluorine and hydrogen fluoride. The author of this article presents data on various phases of the problem and emphasizes the need for a much broader understanding of the physiological effects of the absorption of fluorides as well as a comprehensive knowledge of their metabolism.

The compounds of fluorine are employed in a wide range of industrial processes, including laundering, ceramic processes, electrolytic production of aluminium, glass industry, magnesium founding and some other foundry processes.

There have been numerous reports of acute illness and fatalities from the accidental ingestion of sodium fluoride in the home. In industry the chief hazard is from inhalation. Fluorine compounds may produce respiratory damage while contact with hydrogen fluoride has resulted in severe acid burns. Möller, Gudjonsson and Roholm described certain bone changes in cases of fluorosis which they believe to be associated with chronic fluoride intoxication.

Reference is made to work that has been done on the determination of the fluorine content of the working atmosphere and also to that on the urinary fluorine excretion of certain industrial workers handling fluorine compounds. The author then presents data obtained by collecting groups of spot urine samples as a means of estimating the level of fluoride exposure associated with characteristic occupations in three different magnesium foundries.

Obituaries

Dr. Lawrence J. Rhea, director of the Pathological institute of McGill University and director of the pathological laboratory of the Montreal General Hospital, died on July 3, at the hospital's Western Division. He was 67.

A native of Texas, Dr. Rhea held his B.S. degree from the University of Texas and graduated from Johns Hopkins University, Baltimore, with the degree of M.D. in 1905. He came to Montreal in 1910, after serving at the Peter Bent Hospital, Boston, and on the staff of Harvard University.

Dr. Rhea became director of the General Hospital's pathological laboratory when he arrived in Montreal. The following year he was appointed assistant professor of pathology at McGill, became associate professor in 1914 and professor in 1938.

He held the rank of major during the last great war, with No. 3 Canadian General Hospital, R.C.A.M.C.

Dr. Rhea was a Fellow of the Royal College of Physicians and Surgeons (Canada), a member of the Association of American Physicians, the American Association of Bacteriologists and Pathologists, the International Association of Medical Museums, and the Canadian Medical Association.

He is survived by his widow, the former Anne MacLatchie, and one son, Lawrence David Rhea, Montreal.

AN APPRECIATION

It was not uncommon to go into the Pathological Laboratory of the Montreal General Hospital and be

told that Lawrence Rhea was away for a time ill; for he was not strong. Pulmonary tuberculosis with laryngeal involvement is not lightly to be shaken off, even without other illnesses. And yet one always knew that he would be back at his work before long. One could feel him so strongly wherever one turned: in his own room—who else could have had a desk so smothered with papers, with specimens, with apparatus; or the museum, so rich in his collections, some of the specimens entirely prepared by himself, and all of them selected by him with unerring discrimination.

But now we know that he will not come back.

It is not easy to say just why Rhea filled so large a place in the life of his hospital and the medical community. No one was ever less anxious to put himself forward than he, although no one was more steadily tenacious of his views, and he was very very shrewd, both in his judgment of men and in his work. Of his kindness of heart hundreds could speak, particularly amongst the younger men. He might well have been called the young man's friend, if it was not that he had so many friends amongst the older men. But his influence was chiefly amongst the young. How many scores he truly educated in his laboratory, for no one worked under him who did not receive a rich training! One could watch the immediate fruition of his influence in the work of the pathological conferences, which became so indispensable a part of the hospital life under Rhea's guidance. Only those on the pathological staff knew what painstaking labour lay behind those conferences. Nothing was ever brought forward that had not been fully prepared, much as a case is built up in a law-court; and not seldom it might be considered as such. The evidence was all laid on the table, both in the written case report and in the remorselessly eloquent tissues. There was no prosecutor it is true, but judgment there always was, rendered dispassionately but inexorably, as Rhea the central figure would put questions to the clinician, the point of which would only become apparent as the path of disease lay bared under his hands.

Year after year in these conferences one saw a steady procession of young men being trained. One could watch their development from their first conference when Rhea would put them forward with his drawled "Now, doctor, just tell us about it", to the later months when they could stand up as demonstrators experienced and enriched with the responsibility he so freely gave them. He had the patience which asked only for honest work. Given that he would spare neither himself nor his pupil; he had no time for self-seeking.

"Massa" Rhea was a transplant from the South; one did not need to be told that. He took deep and permanent root in Canada, but he had a mind and nature that knew no national limitations, strong as was his love for the country of his birth. He served with No. 3 Canadian General Hospital in the last war, and in company with John McCrae was responsible for showing that many obscure cases of fever which had been labelled "P.U.O." were actually paratyphoid infections.

His death creates a peculiar sense of loss, for he moved amongst his colleagues as a lovable and unforgettable personality. H.E.M.

Dr. Erastus Aull died at his home in Calgary, on July 2. He was one of Calgary's oldest practising physicians. He had been in ill health for some time preceding his death. He was born in Belleville, Ont., where he received his education before entering Trinity College, from which institution he graduated in medicine in 1899. He practised in Toronto, for a year, then took postgraduate work in Edinburgh. Following this, he spent a year as house surgeon at the Winnipeg General Hospital in 1903, coming to Calgary in 1904. He is survived by his widow, three sons and two daughters.

Dr. Brandur Jonsson Brandson, professor emeritus of surgery, died at his home in Winnipeg on June 20. Few doctors in Western Canada have been more widely known and deeply loved or have exercised a greater influence among their own people and in the field of medicine.

Born in Iceland, June 1, 1874, he came with his parents to Minnesota at the age of four. He graduated in arts from Gustavus Adolphus College at St. Peters, Minn., and in medicine from Manitabo Medical College in 1900. For five years, interrupted by a year in Great Britain, he practised at Edinburg, N.D. With his life-long friend, Dr. O. Bjornson, he returned to Winnipeg in 1905.

For a time they practised in partnership but later each took the line of work for which he was specially fitted. Dr. Bjornson became professor, then emeritus professor, of obstetrics, while Dr. Brandson rose by successive steps to be lecturer in surgery, associate professor, professor, head of the department of surgery 1927 to 1934, and on his retirement, emeritus professor. At the convocation last May the University conferred on him the degree of Doctor of Laws, *honoris causa*.

This was not the first honorary degree granted him. In 1930 he was appointed a representative from Canada to attend the millenium of the Althing, the Icelandic parliament. At Reykjavik the University of Iceland conferred the honorary degree of Doctor of Medicine. Five years later the Icelandic government made him a Grand Knight Commander of the Royal Icelandic Order of the Falcon. At the 98th annual meeting of the British Medical Association in Winnipeg, 1930, Dr. Brandson was one of the vice-presidents in the Section of Surgery. The Winnipeg Medical Society granted him life membership in 1943. He was a Fellow of the American College of Surgeons, and a Charter Fellow of the College of Physicians and Surgeons of Canada.

In his arts course Dr. Brandson had as his friend and classmate the late Thomas H. Johnson who also went to live in Winnipeg and became Attorney-general of Manitoba. Though Brandson took a keen interest in politics and was repeatedly urged to contest an electoral district, he never allowed his name to go for nomination.

At the time of his death he was honorary president of the First Lutheran Church, Winnipeg. An institution very dear to his heart was the Icelandic Old Folk's Home at Gimli, the "Home of the Happy Sunset".

In addition to his early postgraduate year in Great Britain and the Rotunda, Dublin, he also studied in London and Vienna. He was a foremost surgeon, possessing that greatest of surgical qualities—sound judgment. His enduring fame, however, will be his gifts as a teacher. Wise, prudent, humane and above all, kindly, he will be long remembered.

He is survived by his widow, two daughters and a son. One daughter is the wife of Major John A. Hillsman, R.C.A.M.C. overseas. The son, Lieut. Thomas L. Brandson, is believed to have been serving as paymaster on H.M.C.S. *Athabaskan*, sunk recently in conflict with German destroyers in the English Channel.

An Appreciation

Dr. Brandson lived a well planned life; the plan was largely his own. He was neither hindered nor helped by what the man in the street calls "luck". He came from Iceland at the age of six and brought with him in embryo most of the qualities which adorned him in later life. His heredity was good, and the physical characters of his native land—his environment—through many generations had produced a race of men who had overcome almost impossible handicaps, and survived in spite of intolerable hardships. Nothing daunted him, in youth or in his age. He taught school in the summer and studied medicine in winter during his whole course, and graduated with honours forty-four years ago. He swept before him every obstacle that hindered his success. He started practice in a city where competition

was keen, and in a short time was a leader in his profession; he maintained this leadership till the end of his days.

His success was not due entirely to his medical or surgical skill and knowledge, he was inspired to help the afflicted and the poor, not only by healing their wounds but by helping them in poverty and in distress; his generosity was only limited by his income, which was large. His last illness though long and distressing he bore with a patience and cheerfulness that the writer has never seen equalled. His faith in the religion of his ancestors never wavered. He fell asleep and as he slept he was called by the voice of one unseen, and he passed from life to immortality as quietly as comes the dawn of a summer day.

E. W. MONTGOMERY

Dr. Thomas R. Corbett, of Crystal City, Man., died on June 22, aged 64. After graduating in 1907 from Manitoba Medical College, he began practice in Snowflake, but shortly after moved to Crystal City. He was coroner, a member of the town and school boards, and a past district deputy of the fourth Masonic district. He is survived by a daughter and three sons, one of whom is Capt. Conner Corbett, R.C.A.M.C., now serving in a base hospital in Britain.

Dr. James Forbes Creighton. The profession will be sorry to learn of the death at the age of 62, of Dr. Creighton in Vancouver on May 5. Dr. Creighton practised for many years at Estevan, Sask., retiring to the Pacific Coast several years ago because of poor health. He was born in Wingham, Ont., and graduated from the University of Manitoba in 1903, registering in this province in 1913.

A colourful figure in Estevan he was a member of the provincial legislature and took a keen interest in all the affairs of the community. He was a member of the United Church and a leading Mason.

A veteran of the Boer War he served with the Gatling Gun Howard Scouts and from 1914 to 1918 served overseas in the First Great War as captain with the Third Field Ambulance.

Surviving are his widow in Winnipeg; two sons, Dr. John O. Creighton who is carrying on his practice in Estevan; Sgt. William D. with the Artillery in Debert, N.S.; his mother, Mrs. John Creighton, Turner Valley; four sisters, Mrs. Carl Ohlson, Mrs. T. E. Lineham and Mrs. J. E. Lineham all of Turner Valley, and Mrs. L. A. Gibson, Winnipeg; two brothers, Dr. William Creighton, Winnipeg, and Dr. John, Nanton, and three grandchildren.

Dr. D. W. Davis. We regret to report the death by an automobile accident of Dr. Davis, who practised for many years at Kimberley, B.C., and had recently retired, intending to start practice in some other locality, preferably on Vancouver Island. His wife, Mrs. Davis, was killed immediately in the same accident, while Dr. Davis, who sustained a fracture of the skull, lingered for a few days. They leave two sons, both of whom are on Active Service in the Canadian Forces.

Dr. Legius Antoine Gagnier, founder of the Electro-Radiology Society of Montreal, died on May 11, at the Hotel Dieu in his 73rd year.

A pioneer of Canadian medical electro-radiology, Dr. Gagnier was a graduate of medicine at Laval University and a member of the Canadian Association of Radiologists and of the Society of Medical Radiology of France. He studied in Europe and in the United States. He was born in St. Martine, Que., in 1871.

A lieutenant-colonel in the reserve army, Dr. Gagnier was former commander of the Beauharnois-Chateauguay Regiment. For a number of years he was attached to the Quebec Workmen's Compensation Commission and to the St. Jean de Dieu Hospital as radiologist.

He is survived by his widow, the former Delia Collerette, four sons, Dr. L. Gagnier, Gaston, Maurice and Dr. Paul Gagnier and four daughters, Mrs. A. A. Brouillard, Mrs. Hector Leduc, Miss Gabrielle and Miss Regine Gagnier.

Dr. David M. Genoff died at his home in Winnipeg on June 17. Born in Russia 57 year ago he came to Canada and graduated from Manitoba Medical College in 1916. For five years he practised in rural Saskatchewan and Manitoba, and then took a postgraduate course in Rush Medical College, Chicago. Returning to Winnipeg in 1921 he specialized in ophthalmology and otolaryngology. He is survived by his widow and two daughters, Mrs. (Dr.) M. S. Margolese, and Mrs. J. Margolis, wife of Capt. Jack Margolis, R.C.A.M.C., now overseas.

Dr. Harry Dawson Johnson, one of the oldest practising physicians in Prince Edward Island, died on June 3, at Vancouver, while attending a meeting of the Canadian Legion War Services. Born in Charlottetown, P.E.I., June 28, 1863, Dr. Johnson graduated in medicine from McGill University in 1885; for the past fifty-nine years he practised his profession in his native city, specializing in diseases of the nose, throat, and ear.

Dr. Johnson was a veteran of the Boer War, in which he served as captain with the Canadian Field Hospital; on his return to Charlottetown he organized and commanded the first Bearer Company of the Army Medical Services in Canada.

In the Great War 1914-18, Dr. Johnson served overseas with the C.A.M.C. as Lieut.-Colonel; upon his return to Canada he was for a time Assistant Director of Medical Services at Headquarters in Ottawa. On his retirement he was made a full Colonel and at the time of his death, he was Honorary Lieut.-Colonel of the 21st Field Ambulance.

During the present war Dr. Johnson was active in the Red Cross and St. John Ambulance organization and had served as Provincial Chairman of the Dependants Allowance Board, and as a member of the Medical Board for the examination of the N.R.M.A. Recruits. He was a man of varied interest and activities and during his lifetime held many positions of honour and trust in civic as well as medical affairs. As a young man Dr. Johnson was an outstanding athlete. He was three years a member of the McGill University football team, and was also prominent in baseball and cricket.

He had an exceptionally pleasing personality, and was held in the warmest admiration and esteem by all who came in contact with him.

At the time of his death he was Honorary President of the P.E.I. Division of the Canadian Legion and P.E.I. representative of the Dominion Council of the Canadian Legion and Canadian Legion War Services; Honorary President and Past President of the St. John Ambulance Association; Past President and Honorary Councillor (1936) of the Canadian Red Cross Society; Registrar Secretary of the Medical Council of P.E.I., and Past President of the P.E.I. Medical Society, Senior Member (1938) of the Canadian Medical Association. He was a member of the Masonic Order and of the Oddfellows. He is survived by his widow, formerly Miss Davine MacLeod, a son, Hammon of Montreal, a daughter, Mrs. Harold Cross of Montreal, and a sister, Miss Mary Johnson, Charlottetown.

AN APPRECIATION

A GREAT MAN.—Those three words fittingly describe the late Col. H. D. Johnson, M.D., C.M. The medical profession in this Province is unique because it had three octogenarians in active practice. So far as the Medical Society and Medical Council is concerned Dr. Harry Johnson was the Dean, and at the time of his

unexpected death in Vancouver was Registrar of the P.E.I. Medical Council, with a long period of faithful service to organized medicine as his record.

It was my privilege to have been his colleague for thirty-six years, and during the major part of that time we were closely associated as members of the Medical Council and members of the staff of the City Hospital.

During those years I learned to respect his opinions and judgment as a doctor and a true gentleman who never failed to give hearty co-operation and firm and continued friendship. For over twenty-five years we worked side by side in the Red Cross Society, to which he gave loyal service, and my last association with him was as member of the St. John Ambulance and Red Cross joint board.

Dr. Johnson was a veteran of the Boer War and the Great War of 1914-1918, and had given most active service in many capacities in this war, especially as provincial chairman of the Dependants' Allowance Board.

There was no more active worker in the Canadian Legion, of which he was a joint founder, and again his loyalty to duty is proved by the fact that he never missed an annual meeting. Thus it was that he was attending the annual meeting this year at Vancouver when he answered the last Roll Call.

No man in the medical profession or in this Province has given so much time and service to the public good and for his country as did Dr. Harry Johnson. A great and good man is gone. May his soul enjoy an eternity of bliss!

W. J. P. MACMILLAN

Captain Charles Krakauer. It was recently learned that Captain Krakauer of the R.C.A.M.C. was killed in action overseas in December, 1943. Dr. Krakauer graduated from Toronto in 1938, registered in Saskatchewan in January of 1941, and practised for over a year at Brooksby. He is the first Saskatchewan doctor to be reported killed in action overseas.

Dr. William James Lepper died on June 20 at his home on Lonsdale Road, Toronto, in his 85th year.

Born in Aurora, Dr. Lepper received his degree from the University of Toronto and for 40 years practised medicine in Bolton. In 1908 he came to Toronto where he practised for 25 years, retiring about 10 years ago. While residing in Toronto he was active in Christ Church, Deer Park.

Surviving are his widow, Elizabeth Maria, and two sons, W. Euston and James Y. Lepper, both of Toronto.

Dr. Thomas Francis Meahan died at his home, New Aberdeen, Cape Breton, on June 21 following an extended period of ill health. He was 42 years of age. A native of Bathurst, N.B., he graduated in arts from St. Francis Xavier University in 1919 and from McGill University in Medicine in 1926.

Dr. H. M. Mosdell, aged 61, secretary of the Department of Health and Welfare of Calgary, since 1934, died on April 30.

Dr. Ernest William Zumstein, aged 59, died in Norfolk General Hospital at Simcoe, Ont., on July 1.

Born in Smithville district, he was a graduate in medicine of the University of Toronto, and practised at Delhi for 30 years. He was chief coroner for Norfolk County for several years, and was coroner at the time of his death. He was a member of the United Church, and leaves a widow, the former Margaret St. Clair Vail; three brothers and a sister, all in Smithville district.

News Items

Alberta

The vacancy caused by the death of the late Dr. George H. Malcolmson, has been filled by one of Alberta's outstanding physicians in the person of Dr. Edgerton L. Pope, professor of medicine at the University of Alberta. Dr. Pope graduated from McGill University in 1900. He is a Fellow of the Royal College of Physicians of London and also of Canada and well qualified to direct the cancer services of Alberta.

In 1942, during the first six months, 24 doctors registered in Alberta, in 1943, fifteen were registered in the same period, while this year only seven were registered the first six months.

This year, seven active physicians passed away from the Alberta ranks, just equal in numbers to the replacements.

The Alberta Union of Municipalities in convention in Calgary recently, unanimously resolved that expense of caring for transients or non-residents, suffering from communicable diseases, should be lifted from the local municipalities. The Alberta director of the Communicable Diseases Section of Public Health addressed the Municipal Convention stressing the venereal disease menace to public health, and condemned severely segregated areas and "bawdy" houses, and placed the burden on the municipalities to clear them out.

Modern health assistance was manifested recently when a plane in Alberta dropped penicillin at Provost Municipal Hospital to treat a child suffering from anthrax.

G. E. LEARMONTH

British Columbia

The Associated Hospitals Services of British Columbia have opened their registration list to include medical men, nurses, and office nurses, etc., and up to date, we understand, there has been a considerable registration. The terms and conditions of this service are extremely good and it is making great strides throughout British Columbia. There is no doubt that this fills a very vital need in the community, and if ever hospital accommodation can be provided in any commensurate proportion to the needs that now exist, this service will be a great boon to all who participate in it.

J. H. MACDERMOT

Manitoba

St. Boniface Hospital was gay with flags and mottoes from June 21 to 25. The occasion was the centenary of the arrival at Red River on June 21, 1844, of four Grey Nuns. They made the trip, following the old fur traders' route, from Montreal to Red River in 59 days. In the hundred years from then to now the Grey Nuns of St. Boniface have built eight hospitals in Manitoba, Saskatchewan and Ontario (Fort Frances). A monument to the four pioneer nuns was unveiled by R. F. McWilliams, Esq., Lieutenant-Governor of Manitoba, on June 25.

Dr. R. K. Chalmers, who has practised at Miniota for nearly forty-five years, was honoured at a surprise party, June 21, on his 72 birthday. Reeve J. R. Lynch acted as chairman and 150 persons signed the register. A lounge chair and cushion and a trilight lamp were presented to Dr. Chalmers and a bouquet of roses to Mrs. Chalmers. Dr. Chalmers is chairman of the municipal school board of Miniota.

ROSS MITCHELL

New Brunswick

Dr. R. J. Collins, Superintendent of the Saint John Tuberculosis Hospital was elected President of the Maritime Hospital Association at the annual meeting held in Saint John in June. The attendance was large, and interest was keen. Hospital problems were discussed by experts and in round table forum. In addition to the general meeting, group organizations held their separate meetings. Notable among these groups was the New Brunswick Society of Radiographers. Much attention was paid to Blue Cross Hospital Plans and Reports.

Major F. C. Jennings has returned to his home on leave after a severe illness in England. It is expected he will continue to be employed in army service in Canada.

Capt. R. J. Collins, R.C.A.M.C. (R) will be Acting Officer Commanding 14th Field Ambulance (R) at Camp Utopia this year.

Major John McLaughlin has returned from overseas service with the R.C.A.M.C. and is at present on leave.

Dr. Fred J. Cheesman, of Saint John, has again been confined to hospital by severe illness. His convalescence is progressing favourably.

Lt.-Col. A. B. Walter, R.C.A.M.C., was a visitor recently in New Brunswick from his appointment as Chief of Medicine at a large military hospital on the east coast.

The severe shortage of interns in several New Brunswick hospitals, due to staggering of dates of graduation of young doctors, has been relieved by the posting of young physicians commissioned in the armed services to fill these vacancies. This action on the part of services involved has been much appreciated by local authorities. Previous to this arrangement the situation had been desperate. The attitude of these men in active service seems to be more mature than could be expected and their appreciation and acceptance of responsibility is most gratifying.

A. S. KIRKLAND

Nova Scotia

Among those who attended the recent annual meeting of the Canadian Medical Association in Toronto were Drs. H. K. MacDonald, W. A. Curry, E. A. Murray, Gordon Wiswell, C. S. Morton and H. G. Grant, of Halifax; Dr. D. F. MacInnis, of Shubenacadie; Dr. P. S. Cochrane, of Wolfville; and Dr. J. G. B. Lynch, of Sydney. We understand that Dr. H. K. MacDonald was re-appointed to the Executive.

During the month of May a graduating class of thirty-two students in Medicine completed their studies at Dalhousie University. It is expected that all but four of this group will be receiving commissions in the Services. For a time some of them will be retained in local hospitals where otherwise an acute shortage of interns would exist.

The Provincial Medical Board met at Halifax on May 12 to carry out routine business and grant licenses to the recent graduates qualified to practise in the Province.

Friends of Dr. F. J. Barton, of New Waterford, will be glad to learn that he is sufficiently recovered from his recent illness to resume practice.

So pleased were the citizens of Louisburg to secure a physician in the person of Dr. W. G. Morson that they have decided to build him a residence.

Dr. R. A. MacLellan, of Rawdon Gold Mines, who was seriously ill for a time, is improving.

It is learned with general regret that ill health has forced Dr. G. A. MacIntosh, Superintendent of the Victoria General Hospital, to take a prolonged leave of absence. First as Resident Physician and later as Superintendent he has been on the hospital staff for over twenty years with the exception of a short period when he served as Chief Health Officer of the Province. His many friends sincerely hope for his rapid recovery. During his absence, Dr. J. F. Hiltz, Assistant Superintendent of the Nova Scotia Sanatorium, Kentville, will carry on his duties.

Dr. J. J. MacRitchie of the Department of Health, and Dr. H. L. Scammell of the Workmen's Compensation Board represented their respective departments at the Maritime Hospital Association Convention held at Saint John, N.B., in June. This was the largest and best meeting yet of this very active organization. Among the well known men who took part in the varied program were Dr. Harvey Agnew of the Canadian Medical Association; Dr. George Stephens, Superintendent of the Royal Victoria Hospital, Montreal; and Dr. Malcolm T. MacEachern, Associate Director of the American College of Surgeons. The latter is always certain of a royal Canadian welcome and especially so in the Maritime Provinces.

Dr. Roy Maxwell, of Glace Bay, who was for a time radiologist for several Cape Breton hospitals, will, it is learned, confine his work to the Glace Bay General Hospital in future. Dr. Fetter, radiologist at St. Martha's Hospital, Antigonish, has also resigned.

Dr. J. Fabian Bates, presently Major in the R.C.A.M.C., plans to resume his practice in Glace Bay in the near future.

H. L. SCAMMELL

Ontario

Dr. L. J. Austin, Professor of Surgery in Queen's University, was honoured by being awarded the Montreal Medal "for meritorious contribution to the honour of Queen's". This medal is occasionally awarded by the Montreal alumni of Queen's. Unfortunately it had to be presented to Professor Austin while he was a patient in the Kingston General Hospital and regret was expressed that presentation could not be made before a larger audience. Principal Wallace and Dr. W. Ford Connell were present as Mr. Roney, of Montreal, extolled the services rendered to Queen's during the past twenty-five years by Dr. Austin.

This notice is somewhat belated as the ceremony took place on May 14. It is a pleasure to note that Dr. Austin is well again and able to again serve the University. Despite his M.Ch. Cantab. he is a Queen's man heart and soul.

Captain G. S. Slocombe, of Selkirk, Ont., has returned from duty overseas and is now M.O. in the Brantford training centre.

Major J. A. McCaffrey who has been venereal disease control officer for the past three years in M.D. 2 has gone overseas. Major Basil Leighton who succeeded Major McCaffrey was also given overseas duty after three months in charge of venereal disease control.

Major J. R. Calder, Major J. T. Elliott, Major A. F. MacKay and Captains S. J. Forest, A. S. Hammond and A. J. Zeidan have returned from overseas and have been assigned to duty in Canada.

M. H. V. CAMERON

Prince Edward Island

Dr. J. A. McMillan, Charlottetown, addressed the Provincial Registered Nurses Association at their Annual Meeting held in Charlottetown, June 1.

It is of interest to note that two of the Island's octogenarian doctors, namely Dr. J. E. Johnston, Tignish, graduate of McGill in 1897, and Dr. R. J. MacDonald, St. Peters, graduate of Trinity College in 1888, are both actively engaged in practice.

Dr. R. D. MacLauchlan, graduate of New York University in 1891, has been quite ill in the Prince Edward Island Hospital. That his condition is now showing improvement is most encouraging.

Dr. B. C. Keeping, Deputy Minister of Public Health, has recently been engaged in delivering a series of lectures on the various aspects of veneral disease.

The many friends of Dr. E. T. Tanton, Summerside, are indeed pleased to see him about as usual, after an appendectomy earlier this spring. Dr. Tanton has three sons in the medical profession: Dr. Benjamin practising in Summerside, Dr. Munsey in O'Leary, and Dr. Clare serving with the Royal Canadian Navy. Some months ago the newspapers carried an interesting article describing an operation at sea, in which Dr. Tanton was transferred from his ship to another to perform an emergency operation.

Dr. Thomas V. Grant, M.P., though actively engaged with his parliamentary duties in Ottawa still finds time to spend some months in practising his profession in the town of Montague where his family reside. Dr. Grant also has three sons in the medical profession: Dr. Roy practising in Summerside, Dr. Earl in Saint John, N.B., and Dr. Norbert serving as a medical officer with the Canadian Army Overseas.

Attending the annual meeting of the Canadian Medical Association Council held in Toronto, were Dr. W. J. P. McMillan, Charlottetown, Dr. J. R. McNeill, Summerside, and Dr. A. J. Murchison, Charlottetown.

Attending the meeting of the Maritimes' Hospital Association held in Saint John in June were Dr. J. A. McMillan, President of the Association, and a member of the staff of the Charlottetown Hospital, and Dr. J. P. Lantz from the staff of the Prince Edward Island Hospital.

Dr. Wendell MacDonald has taken over as radiologist at the Prince Edward Island Hospital, Charlottetown, succeeding Dr. J. C. Houston who has been in charge of the work for the past twenty years, he in turn had succeeded the late Dr. H. D. Johnson. Dr. MacDonald is a brother of the late Capt. Kenneth MacDonald, M.C., and recently returned from Montreal where he had been taking special training in radiology at the Royal Victoria Hospital.

A. J. MURCHISON

Quebec

Dr. Frank G. Pedley, university medical officer and assistant professor of public health and preventive medicine, McGill University, will leave some time in the near future for London, England, where he will take over his duties in the health section of the United Nations Relief and Rehabilitation Administration. It is also understood that Dr. Pedley has applied for two years' leave of absence from McGill.

A veteran of the first world war, in which he was awarded the Military Cross Dr. Pedley was born in Winnipeg, the son of the late Rev. Hugh Pedley for 17 years minister of Emmanuel Church, Montreal. Dr. Pedley was educated at the High School of Montreal, McGill University, Johns Hopkins University and Harvard University. From 1925 to 1927 he served as assistant professor of industrial hygiene at Columbia University, College of Physicians and Surgeons, joining the staff of McGill University in 1927 as lecturer in industrial medicine. Later he was promoted to the position of assistant professor.

In 1930 Dr. Pedley became executive director of the Financial Federation, serving in this capacity until 1938 when he returned to McGill as assistant professor in public health and preventive medicine, and university medical officer.

When Dr. J. B. A. Michaud was mayor of Boucherville he was not entitled to accept from the village corporation remuneration for innoculating citizens against a threatened diphtheria epidemic, the Court of Appeals decided recently in a judgment dismissing the physician's action for $504. The judgment dismissed a Superior Court ruling which earlier had granted the full amount of the claim.

The action resulted from services rendered by Dr. Michaud to some 126 Boucherville citizens after he was named medical officer by the Bureau of Hygiene in the face of a threatened epidemic in October, 1938. No claim for services was made by Dr. Michaud on the municipal corporation for some years and then only after he was no longer mayor. He then sent a bill for $504, which was refused by the municipal council, on the ground that, as a member of the council of the day, Dr. Michaud was not entitled to accept remuneration for his services.

The Court of Appeals upheld the contention and dismissed the action. Rendering the majority judgment for the court, Mr. Justice St. Germain said that the appointment of a member of the municipal council to an office carrying with it remuneration was illegal, and was a contravention of the rules of public order under the municipal statute dealing with fraud and corruption.

The Provincial Bureau of Statistics, by authority of Hon. Oscar Drouin, Minister of Trade and Commerce, has just issued its "Statistical Year Book", the 29th of the series. Owing to war conditions, and following the example of the Dominion Bureau of Statistics, this edition is for both the years 1942 and 1943.

This year's volume contains the final figures of the 1941 Federal Census. The Provincial Statistician, Mr. Samuel Gascon, gives in the Preface the following analysis: "The decennial Census shows that the total population of the Province on June 1, 1941, was 3,331,882 inhabitants, as against 2,874,662 in 1931, while that of Canada was 11,506,685. During the decade, the population of the Dominion increased by 1,129,869 souls. Of this number, Quebec contributed an increase of 457,220 or 40%. The increase in the population of the Province of Quebec was 15.90% as compared with 10.89% for the whole of Canada. The population of the Province of Quebec has now attained 28.96% of the Dominion as compared with 27.70% in 1931. According to the Census of 1931, the population of the Province of Ontario exceeded this province by 557,021 souls whereas according to the last Census, the excess was only 455,773.

"The population of French origin was 2,695,032 as against 2,270,059 in 1931. It is therefore apparent that during the decade, the contribution of the French element in the increase of 457,220 of the population of Quebec was 424,973. The population of races from the British Isles (English, Irish, Scotch and others)

was 452,887 as compared with 432,726 in 1931 or an increase of 20,161 souls. This is an increase of 4.6% for the British element whereas the French group shows an increase of 18.7% as compared with 15.90% for the whole of the Province. The French proportion of the population of the Province is 80.9% as against 13.6% for the British element.

"The urban population of the Province numbers 2,109,684, and the rural population 1,222,198, *i.e.*, 63.32 and 36.68% respectively. Between 1871 and 1941, a period of seventy years, the rural population of the Province only increased by 302,533 whereas the urban population shows an increase of a little less than two millions, the percentage of the urban population increasing from 19.50 to 63.32 whereas the rural population decreased from 80.50 to 36.68. It must be pointed out, however, that this movement of the population towards urban centres was stemmed during the course of the decade previous to 1941; in fact the urban population of the province in 1931 was 63.10% as against 36.90% for the rural population as compared with 63.32 and 36.68% respectively in 1941.

"It is the population of French origin which shows the lowest percentage of residence in cities, towns and villages. A classification of the population indicates that the French group has an urban proportion of 58.13%. As regards the other nationalities, the proportion of urban population is as follows: British races, 79.9%; Hebrews, 99.3%; Italians, 96.4%; Poles, 88.8%; Germans, 73.3%; other races, 89.5%.

"The decrease in the birth rate, after the crisis of 1930, is felt in a classification of the population by age groups. For the first time, the population under ten years of age is less than that of ten to twenty years. According to the 1941 Census, the group under five years accounts for 10.61% of the total population of the Province; the group of five to nine years for 10.44%; ten to fourteen years, 10.85%; fifteen to nineteen years, 10.54%. This trend is contrary to all previous censuses and where the highest percentage was shown in the group of less than five years and then decreased from group to group. If we go back fifty years to the Census of 1891, it will be seen that the population of less than twenty years of age was exactly 50.10% while in 1931, it was only 46.01% and dropped to 42.44% in 1941. If we bear in mind that the group between twenty and twenty-five years of age accounts for 9.13%; we can say that the median age of the population is about twenty-four years."

Saskatchewan

Surgeon Lieut.-Commander R. G. Yoerger is in the reserve force of the R.C.N.V.R., attached to the divisional strength of H.M.C.S. *Unicorn*, Saskatoon, which permits him to resume his practice in the Humboldt area.

Dr. C. J. Houston, of Yorkton, is the new member of Council for Medical Electoral Division No. 4, having succeeded Dr. R. A. Dick, of Canora, who is now residing at the Pacific Coast.

Among the four Saskatoon members of the armed forces to receive honours conferred by the King in His Majesty's Birthday Honours List was Major James G. K. Lindsay, O.B.E., who was appointed Member of the Most Excellent Order of the British Empire. Dr. Lindsay was Registrar of the College of Physicians and Surgeons prior to his enlistment in July, 1940. His wife and five children reside at 815 Fifteenth Street, Saskatoon.

Colonel B. C. Leech, of Regina, is with the Second Canadian Infantry Division, R.C.A.M.C., Overseas.

Major F. F. Ferguson, of Moose Jaw, is now with the 5th Canadian General Hospital Unit of the R.C.A.M.C., Overseas.

H. D. HART

General

At the Seventh Annual Exhibition of the American Physicians' Art Association during the annual meeting of the American Medical Association this June ten Canadian confrères participated with a total of 27 entries. Awards have been given to: G. H. Agnew, Toronto, Ont., 2nd prize for Oil Portrait, Honourable Mention for Oil Landscape; R. B. Gullison, Toronto, Ont., Honourable Mention for Photography; A. F. Perl, Provost, Alta., 3rd prize for Colour Photography; G. G. White, Port Colborne, Ont., Honourable Mention for Photography.

Physician-Artists' Prize Contest. — The American Physicians Art Association, with the co-operation of Mead Johnson & Company, is offering an important series of War Bonds as prizes to physicians in the armed services and also physicians in civilian practice for the best artistic works depicting the medical profession's "skill and courage and devotion beyond the call of duty".

Announcement of further details will be made soon by the Association's Secretary, Dr. F. H. Redewill, Flood Building, San Francisco, Cal.

Book Reviews

The War and Mental Health in England. J. M. Mackintosh. 91 pp. 95c. Commonwealth Fund, New York, 1944.

This book is primarily concerned with a review of the mental health problems in England during these war years. Reference is made to the early experience in recruitment which at the beginning of the war resulted in unnecessary wastage, because insufficient use was made of skilled psychiatric advice and considerable numbers of unstable men were drafted into the army. The author summarizes the problems in civilian mental health and, particularly, the mental health of children and indicates the significance of the loss of sense of security which was an important causative factor in the development of behaviour disturbances in many of the children who were moved from their homes to safer areas. A special section is devoted to a discussion of the need for trained personnel and the importance of educating the public as a central feature of the post-war program for mental health. This book will be of special interest to public health officers and all physicians who are concerned with the prevention of disease and the promotion of health.

Official History of the Australian Army Medical Services 1914-1918. Colonel A. G. Butler, Vol. III, Problems and Services, Australian War Memorial, Canberra, 1943.

This stout book of 1,103 pages is the final volume of the official history of the Australian Army Medical Services in World War I. It is a part of the great mosaic designed by the Australian War Memorial to commemorate the deeds and sacrifices of Australia's sons and daughters in the earlier as well as in the present global combat. The historian, by virtue of his medical training and military experience, is eminently suited to his task. A Cambridge graduate, medical health officer for the federal district of Canberra, he was the first regimental medical officer to set foot on Gallipoli where his conspicuous gallantry at the landing won him the D.S.O., and early in 1918 he took charge of No. 3 Australian General Hospital at Abbeville. The first volume covered the organization of medical services for the Australian Imperial Force and the fighting in New Guinea, Gallipoli and Palestine. The second volume dealt with the Australians in France.

The volume under review is concerned with such technical problems as chemical warfare, moral and mental disorders, venereal diseases, the influenza pandemic and 1918-19, the scientific background of army medicine and the surgical problems of repair and reenablement; with the naval and air medical serivces; with the technical specialties, dental, pharmaceutical services; nursing and massage services and the aftermath of war. The final section is devoted to statistics. There is a good index and the text is carefully documented.

This work is a record of the various auxiliary services of the Australian Medical Corps in 1914-18 and as such deserves its place. However, its scope is much wider than a mere recording of events. History has been defined as philosophy teaching through experience. Colonel Graham Butler reveals himself as a philosopher seeking to establish principles which can be applied in the present and will be valid for the future.

The writing and editing of the trilogy, begun in 1922 and not completed till 1943, has been an enormous task. How well the task has been done is attested by the award this year of the gold medal of the Australian Branch of the British Medical Association to Col. Butler for his services in this respect. While the principal appeal of the History will naturally be to Australian readers, there is much, particularly in this third volume that can be read with profit by medical officers, nursing sisters and army administrators in any of the allied countries.

Clinical Audiometry. C. C. Bunch. 186 pp., illust. $4.60. C. V. Mosby, St. Louis; McAinsh, Toronto, 1943.

This book gives an excellent account of the audiometer, its development, and clinical uses. The author is particularly well qualified to write on this subject, as he is well known for his research in this field and his long and careful observations of the practical tests of the various types of deafness. He was chosen to study "the practical application of methods of testing hearing" in 1917 by the late Dr. L. W. Dean, and has made great progress not only in the theoretical but also in the practical application of the instrument in the clinic. The benefit of his experience is set forth in interesting style with many practical examples of the average and more difficult types of deafness which he has studied. He points out the practical value of the sound proof room and describes one which can be installed for the sum of $150.00. The value of the audiometer in selecting a hearing aid is pointed out in detail. All in all, it is a book well worth the study of both student and specialist.

The Jews and Medicine. Essays. H. Friedenwald. 2 vols., 817 pp., illust. $7.50. Johns Hopkins Press, Baltimore, Md., 1944.

This book is a collection of more than forty essays written by Dr. Harry Friedenwald, humanist and bibliophile. It reflects the cultural atmosphere of medical Baltimore and is obviously a labour of love, the work of a booklover, a careful historian and a man steeped in the history of his people.

The same passion which led Isaac D'Israeli to write the *Curiosities of Literature* is here apparent in Friedenwald. The basis of these studies is formed by books chiefly of antiquity and of the Middle Ages, and the texts thoroughly explored and generously presented. The result is not a formal chronological history of the Jewish contribution to medical history, but a series of essay-studies on Jewish physicians and Jewish medical works and customs of the past. It will appeal mainly to bibliographers and serious students of medical history, for it is essentially a source-book. The more casual reader however will find much in the nature of *curiosa*, glimpses of the mediæval world, and notably a closely documented account of the celebrated Moses Maimonides.

To turn over the pages of these volumes is like taking a conducted tour through an Old World library rich in medical volumes of antiquity. The style is straightforward and pleasant, though at times it could create more interest by being less flat and factual.

Dr. Friedenwald has been well served by his publishers who have mounted his work in two handsome volumes which are a delight to handle. One must also pay tribute to the illustrations in which title pages and sample pages of original works are excellently reproduced.

Human Constitution in Clinical Medicine. G. Draper, C. W. Dupertuis and J. L. Caughey. 273 pp., illust. $4.00. Paul B. Hoeber Inc., New York, 1944.

This book comes from twenty years' experience in the Constitution Clinic which grew out of Dr. Draper's work set forth in his first volume on Human Constitution.

The sex complex which was used to account, among other things, for gall bladder disease in man and peptic ulcer in woman is now elaborated with the "androgynic mosaic", and statistical methods are applied to the vast numbers of observations that have been made in the clinic. The pitfalls into which a clinician may fall if he attempts to make diagnoses by using only laboratory methods, without knowing all about the person who presents the deviations from arbitrary norms are clearly shown. "The total personality of the patient is inseparable from the things that happen in him or to him".

The reviewer recommends the book enthusiastically, especially to the younger practitioners, who are sometimes amazed by the estimation of a patient by an experienced clinician which seems to be intuitive but is really an unconscious application of the principles elucidated by Dr. Draper and his associates.

The illustration on page 102 has its A and B transposed and the "ponderal index" is weight/stature^3 on page 110, but height/V^{3}weight on page 179. These are hardly identical.

The cube root should not deter the reader who has forgotten his mathematics. The book is delightful reading and every page is thought provoking.

Nurses Handbook of Obstetrics. L. Zabriskie and N. J. Eastman. 7th ed., 714 pp., illust. $3.25. Lippincott, Montreal, 1943.

The seventh edition of this well-known textbook on obstetrics for nurses has now been published. The book has been almost completely rewritten and many new illustrations have been added. Pre-natal care, anæsthesia and analgesia, the mental hygiene of pregnancy, the nursing care of the new baby and of the premature baby, and the after care of the baby are all considered at some length. A special section of the book deals with the delivery at home. The work is essentially a practical one and the extensive illustrations are a feature of the work. Written primarily for the nurse, it is a book which might well be included in the library of every school for nurses and in the hospital medical library.

BOOKS RECEIVED

Safe Convoy. The Expectant Mother's Handbook. W. J. Carrington. 256 pp. $3.00. Lippincott, Philadelphia; Longmans, Green, Toronto, 1944.

The Hippocratic Oath. L. Edelstein. 64 pp. $1.25. Johns Hopkins Press, Baltimore, Md., 1943.

A New Test for Syphilis. A. L. Brown. 25 pp., illust. Dr. Brown's Clinical Laboratory, Columbus, Ohio, 1943.

The Sources of Life. S. Voronoff. 240 pp., illust. $5.25. Bruce Humphries, Boston; Ryerson Press, Toronto, 1943.